EASTERN MICHIGAN UNIVERSITY
LIBRARY
- MAY 1972
SOCIAL SCIENCES

VOL. X • NO. 2 • APRIL 1972

DEVELOPMENT DIGEST

LIBRARY
EASTERN MICHIGAN UNIVERSITY
YPSILANTI
U. S. DEPOSITORY DOCUMENT

Y 5 1972

The DEVELOPMENT DIGEST is prepared for the Agency for International Development by the National Planning Association, a private, non-profit organization in Washington, D. C.

We would appreciate comments of an editorial nature and suggestions or material for possible inclusion in the DIGEST. Please address:

Editor, DEVELOPMENT DIGEST
National Planning Association
1525 18th Street, N. W.
Washington, D. C. 20036

The material included in the DIGEST adheres faithfully to the sense of the original. It does not, however, indicate omissions, minor editorial changes, etc. For scholarly purposes, the original source should be consulted.

Inclusion of material in the DEVELOPMENT DIGEST does not imply that the opinions and conclusions expressed herein are those of the United States Government or of the National Planning Association.

The material in the DIGEST may be freely reproduced in Latin America, Africa, and Asia (except Japan), either in English or in translation, or may be adapted, provided credit is given to the author and original source, and further provided that the sense of the original is not distorted. Where material carries a copyright notice, this notice must also be included in the credit citation.

Use of funds for printing this publication approved by the Director of the Bureau of the Budget June 2, 1966.

For information on how to obtain the DIGEST, see inside back cover.

DEVELOPMENT DIGEST

A quarterly journal of excerpts, summaries, and reprints of current materials on economic and social development

Gordon Donald, Editor; Pushpa Nand Schwartz, Associate Editor
Prepared by the NATIONAL PLANNING ASSOCIATION

for

Agency for International Development, U. S. Department of State

LIBRARY
EASTERN MICHIGAN UNIVERSITY
YPSILANTI
U.S. DEPOSITORY DOCUMENT

CONTENTS

Volume X - Number 2 April 1972

ENVIRONMENT CONFERENCE

UNITED NATIONS CONFERENCE ON THE HUMAN ENVIRONMENT 3

DEVELOPMENT AND ENVIRONMENT: THE FOUNEX REPORT
United Nations Panel of Experts meeting in Founex, Switzerland 5

STOCKHOLM AND THE DEVELOPING COUNTRIES
Miguel Ozorio de Almeida 18

REPLY TO BRAZILIAN STATEMENT BY U. S. DELEGATE 26

COMPUTER CURVE TO DOOMSDAY
Claire Sterling 29

THE STUDY OF MAN'S IMPACT ON CLIMATE: THE SUMMARY REPORT 33

LIVESTOCK

THE ROLE OF ANIMAL AGRICULTURE
U. S. Agency for International Development (AID) 45

A CHALLENGE TO RUMINANT AGRICULTURE
P. A. Putnam, L. A. Moore and N. D. Bayley 52

GRASSLAND IMPROVEMENT
A. T. Semple 56

INTEGRATION OF THE GRAIN AND LIVESTOCK SECTORS IN THE NEAR EAST
Food and Agriculture Organization of the United Nations (FAO), Rome 63

COOPERATIVES FOR IRAN'S NOMADIC HERDSMEN 71
U. S. Agency for International Development (AID)

EFFECTIVE PLANNING TO INCREASE LIVESTOCK PRODUCTION IN DEVELOPING COUNTRIES 74
R. E. McDowell

EXPORT DEVELOPMENT I

EXPORT DEVELOPMENT—BASIC PRINCIPLES AND METHODS 83
Amicus Most

EXPORT EXPANSION: EXCHANGE RATE AND TRADE POLICY 98
Constantine Michalopoulos

EXPORT FINANCING 106
Paul D. Lucas
The Secretariat of the United Nations Conference on Trade and Development (UNCTAD), Geneva

EXPORT INCENTIVES 114
Secretariat of UNCTAD, Geneva

Unless otherwise indicated, currency is expressed in U. S. dollars.)

ENVIRONMENT CONFERENCE

STOCKHOLM, 1972

THE OFFICIAL SYMBOL FOR THE UNITED NATIONS CONFERENCE ON THE HUMAN ENVIRONMENT, STOCKHOLM, JUNE 5-16, 1972
[PHOTO: UNITED NATIONS]

United Nations Conference on the Human Environment

(Excerpted from a UN pamphlet on the Conference)

The Stockholm Conference on the environment dates back to a Swedish initiative in the Economic and Social Council in 1968; later in the year the General Assembly passed a resolution calling the Conference. At that time its main purpose was to alert world opinion to the growing danger of pollution, the rapid growth of human settlements and the degradation of soils and other natural resources, and to provide a basis for action to meet these problems. Since then public interest has mounted so rapidly that the emphasis is on action. Its aims are now to identify the most urgent environmental problems and obtain agreement on actions to deal with them. A special Conference Secretariat was set up with Maurice F. Strong of Canada as its Secretary-General; he took up his post on 1 January 1971. A 27-nation Preparatory Committee has met four times to date. The Conference will be held June 5-16, 1972 in Stockholm, Sweden. Participants will include all Member States of the United Nations and its specialized agencies.

The Conference will be a meeting of governments at the Ministerial level, with participation by observers of other interested organizations. It will consist of a plenary session which will meet throughout the two weeks. Sitting concurrently will be three committees. One will deal with identification and control of pollutants of international significance, monitoring and surveillance, and the international organizational implications of the proposed actions. The second will deal with environmental aspects of natural resources, and the subject of development and environment. A third committee will study problems arising from the spread of human settlements and necessary measures that need to be taken in the field of education and information. Preparatory activities have included intergovernmental working groups on soil conservation, marine pollution, monitoring, conservation and on a Declaration on the Human Environment. These working groups have the task of formulating proposals for specific action, including possible conventions or agreements, which may be initiated before the Conference itself. Work is also going on to define activities that will need to be continued long after the Conference. A report on "The State of the Environment" is being prepared by a representative cross section of the world's leading authorities for publication by Spring 1972.

The substantive agenda items to be discussed at the Conference will be:

1. <u>The Planning and Management of Human Settlements for Environmental Quality</u>.

2. The Environmental Aspects of Natural Resources Management: Natural resources are broadly defined as including animal, botanical and mineral resources.

3. Identification and Control of Pollutants and Nuisances of Broad International Significance, including those produced by manufacturing, transportation and energy production, agriculture and mining; measures for maintaining and improving the atmosphere, hydrosphere and lithosphere (air, water and land).

4. Educational, Informational, Social and Cultural Aspects of Environmental Issues.

5. Development and Environment, including the effects of environmental policies on international trade, industrial development, and foreign assistance.

6. International Organizational Implications of Action Proposals, including reviews of existing international organizations, and consideration of alternative means of meeting the institutional needs of the United Nations system in the post-Stockholm period.

Modes of Action. The aim of the Conference is to stimulate governments, international organizations and other institutions to take action, individually and collectively, to ensure that the global environment is adequately protected against further degradation. Some of these actions might include establishing an international environmental monitoring system, setting of international standards or limits for chemical, physical and biological contaminants, and agreements aimed at reducing marine pollution. For a small number of items, a sufficient degree of scientific and political consensus appears to exist to permit action to be completed by the Conference or at least carried through an initial stage. In other cases, a sufficient degree of both scientific and political consensus may be achieved so that concrete recommendations for future actions can be decided upon at Stockholm. At the most fundamental level, however, new concepts are required. Examples might be major adjustments to economic theory to cope with recycling technologies, or with the conservation of resources for use 50 or 100 years hence. It is hoped the Conference will adopt a Declaration on the Human Environment which will state universally recognized fundamental principles recommended for action.

Development and Environment: The Founex Report

United Nations Panel of Experts
meeting in Founex, Switzerland

[Developing countries have their particular kinds of environmental problems, which should be dealt with in their overall economic plans. Fears of developing countries that their trade and/or access to aid may be harmed by industrial countries' concern with the environment are partly legitimate and they must protect their interests, but there are positive opportunities for them too.]

The environmental problems of developing countries fall broadly into two categories—the problems arising out of poverty, or the inadequacy of development itself, and the problems that arise out of the very process of development. The problems in the first category are reflected in the poor social and economic conditions that prevail in both the rural and urban areas. For most developing countries these are, by far, the problems of greatest importance. But as the process of development gets under way the problems in the second category also begin to emerge and to gain in significance. The environmental policies of developing countries must naturally be concerned with both categories of problems, but the remedial approaches to the first set of problems are closely interwoven with policies for overall development. These policies should, of course, embrace wider dimensions than the growth of gross national product alone. Problems of poor water supplies, inadequate sewerage, sickness, nutritional deficiency, and bad housing need to be dealt with in the process of planning and policy making. This Report will not attempt to elaborate further upon environmental issues of that kind.

The environmental problems arising from the development process, though possibly of lesser impor-

tance in its early stages, will clearly gain in significance as the development process gathers momentum. The transformation of agriculture, the development of industry, the creation of networks of transportation and communication, and the growth of towns, are all integral parts of development. But it needs to be recognized that the process of growth and change in each of these sectors can be accompanied by adverse side effects which could in many cases be avoided, or at least mitigated, by sound planning and policy. The experience of the developed countries has shown that these side effects could, if ignored, attain formidable dimensions and cause damage and disruption on a wide scale. The developing countries have an opportunity to avoid some of the mistakes of the past.

These side effects are commonly grouped into the following categories:

1. Resource deterioration: the deterioration, for example, of mineral, soil or forest resources;

2. Biological pollution: the pollution represented by agents of human disease, and by animal and plant pests;

3. Chemical pollution: arising out of air pollutants, industrial effluents, pesticides, metal, and detergent components and similar agents;

4. Physical disruption: as reflected, for example, by thermal pollution, silting and noise; and

5. Social disruption: of which congestion and loss of a sense of community are examples.

The first two categories are commonly experienced by most developing countries, as are also silting and perhaps social disruption, while urban air pollution is of importance chiefly in the larger cities of certain developing countries. The relative importance of these various side effects depends partly on the ways in which development activities relate to the carrying capacity of a country's natural, and even social, system. Such factors as the speed at which environmental degeneration is taking place, the degree of its severity, the area that it covers, whether the environmental impact is reversible or irreversible, and at what cost and over what period of time are all relevant.

Within a framework appropriate to its situation, each country may ascertain the nature of its environmental problems, and examine alternative forms of action for dealing with them. Environmental side effects encountered in the various sectors should receive selective treatment. Those side effects which directly frustrate

major objectives in terms of development priorities should be given the most immediate attention for remedial action.

Agriculture

The process of agricultural development often involves the transformation of low productivity systems of agriculture into more modern systems where productivity is relatively high, and may generate environmental side effects. But environmental side effects may also be found in traditional systems of agriculture as a result of rapid population growth. Even with systems that have persisted for centuries, successfully cultivating the same lands without irreversible damage, new environmental problems may be created by population pressure on the land.

Traditional agriculture in many tropical regions is characterized, particularly under stress of expansion, by a range of environmental hazards. These include leaching, notably the rapid leaching of nutrients and degradation of planted farmland following the removal of a forest; rapid soil depletion resulting from permanent cultivation which the relative infertility of the soil cannot support without the addition of nutrients; soil erosion through variable and heavy rainfalls and prolonged droughts or flash floods; and indiscriminate loss of forest resources through slash and burn techniques. Although much of this kind of environmental deterioration can be corrected if unlimited funds are available, some are so costly to correct as to be effectively irreversible. The fragility of tropical eco-systems may cause environmental deterioration to proceed rapidly and their recovery to be slow. In one instance, the establishment of an agricultural colony failed when deforestation resulted in the hardening of lateritic fields within five years; restoration, on the other hand, will take decades. In another case, previously ungrazed savanna was destroyed by overgrazing in two to three years, and will probably be lost to production for a very long time. There are opportunities for preventing some of these environmental hazards through proper planning and anticipatory action. For instance underemployed labor that frequently abounds in rural areas may be mobilized in terracing mountainsides and in reforestation programs. Many of Africa's current marginal lands, for example, have all the necessary elements for successful reclamation through new management techniques.

The environmental hazards in modern agriculture arise mainly from the chemical control of weeds and pests and from irrigation works. Fertilizers, on the other hand, would not appear to pose a serious threat at their present level of use in the developing countries. The side effects of insecticides and pesticides need to be watched fairly carefully; their toxicity to fish and birds, as well as their persistence and mobility, make them a hazard beyond

their target area. Irrigation projects, unless matched by drainage facilities, can result in salinization and waterlogging. In one country modern canal irrigation serviced forty million acres in 1949, of which five million acres suffered from salinization and waterlogging by 1959. However, much of this land has since been reclaimed through appropriate management. Even the welcome emergence of the high-yielding varieties of wheat, rice or maize can sometimes give rise to certain negative side effects, both because they require larger quantities of pesticides and because they replace hardy native species which, by natural selection, are often better suited to the adversities of local conditions and are valuable for interbreeding. Constant tillage, which is facilitated by mechanization, can also damage the soil structure. Modern agriculture would be impossible without chemical fertilizers and pesticides, high-yielding seeds and irrigation works, but it is important that their side effects should also be taken into account in planning.

River basin development projects are instruments of major importance for economic development. However, many of the environmental problems which are commonly discussed have arisen in connection with the construction of these projects. This underlines the need for careful study and analysis in the design of large dams or dam sties, so that their negative side effects can be minimized through proper planning. Some of the environmental problems associated with river basin projects include the spawning of water-born diseases, the filling of reservoirs with sedimentation, the drying up of downstream fisheries, the spread of salinization and waterlogging in associated irrigation projects, the inundation of valuable agricultural and forestry land, the displacement of population and the loss of mineral resources or wildlife areas. The emergence of most of these adverse effects is gradual; some can be readily corrected, but others are practically irreversible. Some of the consequences can be on a very large scale and may even frustrate the purpose of the project, e.g., siltation behind a dam. Many of them can be anticipated by preliminary analysis. It must be borne in mind, however, that many of the associated environmental costs may simply have to be assumed in the pursuit of benefits offered by the project.

Industry

Pollution emanating from industrial development represents more of a potential than an actual threat at this time in most developing countries. However, there are a number of isolated instances of industrial pollution. The developing countries have an advantage in so far as they can learn from the experience of the developed nations. By taking sensible decisions on the location of industries and their waste disposal, and by instituting social controls under which the private sector must function, they can avoid

some of the worst environmental problems of industrial pollution. It would also be useful to identify cases where labor-intensive technologies may produce less environmental disruption.

Transport

A basic choice in the field of transport is between systems that provide mass transportation and the owner-operated automobile. In the United States, and increasingly in Western Europe and Japan, the choice of the automobile as the primary means of personal transportation is now having critical environmental consequences: air pollution with damage to people, vegetation and landscape; increased accidents; pressure on urban space. In the transport policies adopted by the developing countries some of these problems may be avoided by providing means of mass transportation, thereby reducing the need for owner-operated vehicles. This is, in any case, indicated by their own level of development and the need to reduce visible disparities among income groups.

Human Settlements

The majority of people in most developing countries still live in rural areas. Often these communities suffer from an inadequacy of services of one kind or another. Problems of health, nutrition, potable water supplies, and drainage are often severely felt in rural areas no less than in the towns. An inadequate infrastructure of agricultural and credit services is also a familiar feature of the rural scene, contributing to the persistence of low levels of production and hence of incomes. The stress of rapid population growth can, in certain situations, aggravate these problems and impose further strains on rural resources.

In such situations, there is often a drift of population to the towns which causes a further worsening of urban conditions. A preoccupation with growing urban problems could, in turn, result in a further neglect of rural areas. Modern social, cultural, and economic activities capable of attracting educated youth may not exist in the rural areas, and this could contribute to growing urban concentration and unemployment. It is, however, unlikely that the expansion of economic activities in the urban areas alone through industrialization will suffice to provide employment opportunities for the full increase in the work force. A substantial part of the increment to population and the work force will need to remain in the countryside, and it is therefore vital not only that employment opportunities be created in rural areas, but that the whole structure of social and economic services in these areas be developed. This places a new emphasis on the rural environment.

In the urban areas of the developing world, environmental quality is virtually synonymous with social welfare. Urbanization can, of course, mean increased economic and social welfare, and urban concentrations of dynamic enterprises can serve a valuable function as "development poles," generating growth throughout wider regions. However, the carrying capacity of any city submitted to rapid population growth is eventually overextended, and the economies of size are displaced by the diseconomies of inadequate infrastructure. Disease, water supply shortages, lack of sewage treatment, congestion and deteriorating housing are all manifestations of environmental stress. The major cities of the developing world experienced a fourfold increase in their populations between 1920 and 1960, and many of them are now confronted with chemical contamination of air and water. Each city has its own carrying capacity, which changes over time. This depends on the level and combination of population, economic and human resources, and infrastructure, which are in turn in constant evolution. But once that carrying capacity is exceeded, degradation proceeds very quickly. There is, however, a high possibility of reversibility in this trend, if sufficient resources can be mobilized, which is not the case with natural systems.

The urban renewal projects in the industrialized countries are one line of attack. Often, however, such projects merely displace the slum population to new slums. Another line of attack is urban dispersal, contingent upon planned allocation of new growth poles in conjunction with newly established industries and new urban settlements. Such planning is already underway in many developing countries. Less capital-intensive renewal schemes should be accorded a high priority. Solid waste collection could also be resolved through mobilizing popular participation. Rather than relying on large inputs of technology or capital in implementing municipal sewerage systems, multiple aerated lagoons which are stocked with fish, or spray irrigation to enhance soil conditioning, could be used.

Some Considerations for Environmental Policy Formulation

No general guidelines or specific formulas can be prescribed at this uncertain stage of our knowledge regarding the interaction of environmental and developmental policies. Each country must find its own solutions in the light of its own problems and within the framework of its own political, social and cultural values. The formulation of environmental goals falls entirely and exclusively within the sovereign competence of the developing countries.

It is important that environmental policies be integrated with development planning. Some of the major policy areas will include a greater emphasis on location of industries, land use policy, urban-rural interaction and community development, and sectoral policies

as described above. The integration will also require a broader definition of development goals than a mere increase in gross national product. The redefinition of development objectives must include greater stress on income distribution and employment, more attention to social services and welfare-oriented public goods. The quality of life in a poor society should be defined in terms of a selective attack on the problems of mass poverty, and development plans should attempt to quantify the improvement that is being sought in eliminating the worst forms of malnutrition, squalor, disease and ignorance. Besides quantitative targets in income growth and employment, similar targets should also be spelled out for social goals, and one way to quantify these would be to establish minimum environmental standards. Each developing country can define for itself the minimum environmental standards that it is seeking in fields such as public health, nutrition, water supply, etc. Environmental indicators can then be devised to measure the progress of the society towards the norms it has established for itself. Environmental standards cannot be fixed for all time to come, and must necessarily be changed as development proceeds.

Project appraisal. It is necessary to find techniques for quantifying the impact of development projects on environment, both favorable and unfavorable, so that the society can choose these projects with a fuller knowledge of their social costs and benefits. All too often the social costs of various projects have been ignored in the initial appraisal, especially when development proceeded under a regime of free enterprise, so that the society's awareness of environmental disruptions resulting from these projects came too late, after construction had been completed. Some of the factors which may have to be considered in making allocation decisions are: 1) the quantity and quality of known and required natural resources, and the probable date of their exhaustion; 2) the existing level of air or water pollution; 3) the suitability of alternative sites, ascertained in terms of environmental spillover effects; 4) the availability or possible development of alternative technologies, and their relative costs; 5) the opportunities for waste disposal and for the re-cycling of raw materials; 6) the impact of the project on environmental disruption, speed of degeneration, degree of severity, possibilities of reversibility; 7) the overall costs of various alternatives.

There is a considerable debate at present on how specific environmental guidelines should be formulated for project appraisal. Some work on guidelines is already underway in certain international financial institutions. In the present state of our knowledge, however, there is need for extreme care in devising guidelines so that they do not become bottlenecks in the implementation of development projects, or raise such issues of detail as are irrele-

vant in the current state of development in many countries. In any case, it is for the developing countries to formulate such guidelines in the light of their own experience and requirements. They should take an initiative in this regard, and discuss this issue at the regional economic commissions, regional banks and other relevant international agencies. No rigid guidelines should be laid down by multilateral or bilateral donors at this stage unless there has been adequate consultation with the recipient countries.

Control methods. There is a wide variety of social controls which can be used for environmental improvement. There are indirect controls relying on the imposition of disincentives, such as taxes, effluent charges, etc., and on giving incentives through subsidies. There are direct controls which range from outright prohibition, statutory regulation or the curtailment of production of toxic materials to administrative measures taken to control location of industrial production or human settlements. No general guidelines can be laid down as to the effectiveness of different controls; each society must find its own balance between direct and indirect controls.

It is also premature at this stage to spell out in great detail what institutional arrangements may be required to implement these social controls, nor can we say anything definite at present about the kind of special legislation that may have to be devised. Among the many institutional arrangements suggested for the consideration of the developed countries are: establishment of separate ministries or departments dealing with environmental control; setting up of environmental standards and indicators and their monitoring by special institutions; proposals for establishing Environment, Technology and Location Assessment Boards and for Environmental Quality Management Services; specific legislation to establish norms for the maintenance of clean air and clean water; new liability legislation regulating compensations for environmental disruption; enunciation of common or collective property rights with regard to such free and hitherto unprotected resources as air, water, soil, etc. Many of these institutional arrangements have greater relevance to the problems of the developed countries than to the developing societies, though the latter can with some profit study the experience of the developed countries with the implementation of these proposals.

Information inventory. In order to formulate environmental policies, the developing countries need a lot more information than they currently possess. It would be useful, therefore, to make a survey of their present state of environment and the major hazards to which they are exposed. They should then undertake studies and research to define the kind of environmental problems that are likely to arise in the process of their development over the next two to three decades. It would also be helpful to compile all existing legislation regarding environmental control, including the regulations dealing with urban

zoning, location of industries, protection of natural resources, and so on. This accumulation of information and knowledge should enable the developing countries to get a clearer perspective on their environmental problems and the corrective actions that they may require at different stages of development.

Implications for International Economic Relations

While we believe that continued development is the only answer to many of the environmental problems of the developing countries, we also believe that these countries cannot afford either to neglect the environmental problems, or to treat environment as a free resource as the presently developed countries too often did in their initial stages of economic progress. Even if the developing countries were to regard the present environmental concern of the developed countries as an irrelevant irritant, they can hardly remain indifferent to, or be unaffected by it. Inevitably, the environmental concern will cast its shadow on all international economic relations. One can perceive these international implications only dimly at this stage. But it is important to anticipate the adverse implications for international economic relations on the one hand, and the great opportunities which may open up on the other, and then to suggest policy measures and institutional arrangements which could reduce the former and maximize the latter. There is, in fact, no other choice if the impending confrontation between the developed and developing countries is to be avoided.

There are growing fears in the developing world that the current environmental concern in the developed countries will affect them adversely in the fields of trade, aid and transfer of technology. Some of these fears may be no more than the inherent fears of the weak in any confrontation with the stronger members of the international community. But it is important that they be articulated clearly, analyzed objectively and provided for in any international arrangements which are made. Perhaps most important, there is a fear that the insistence of the developed countries on rigorous environmental standards for products exchanged in international trade may well give rise to a "neo-protectionism." Many of the developed countries will be loath to see their production and employment suffer if their export prices rise as environmental standards are enforced within their borders; they can argue that imports from developing countries where less rigorous environmental standards prevail should either be taxed or banned. The import-competing sectors and organized lobbies are likely to join in this outcry. Agricultural products may be the first to suffer. Some industrial products, notably chemicals, may fare no better.

In analyzing these fears regarding trade disruption, we have to make several distinctions. First, there may be some exports of

the developing countries (e.g., lead, high sulphur fuel) which are increasingly displaced by the development of a non-pollutive technology; the sources of the newly favored materials may or may not be found in (other) developing countries. The recycling of raw materials may also reduce the demand for some primary exports from the developing countries. These shifts in demand are the outcome of technological advancement. There should be an anticipatory study of such export threats, development of an early warning system, and measures to enable the seriously affected countries to restructure their production and exports. Second, as has already happened in the case of some products on sanitary grounds, there is the possibility of a rise in non-tariff barriers against these exports of the developing countries which carry some environmental hazards. Dairy products, fish, meat, fruits and vegetables are among the likely products where the developed countries may enforce very high environmental standards. Already the import of fruits and vegetables carrying traces of DDT has been banned in certain European countries. Insofar as the standards enforced in the developed countries are primarily meant to prevent health hazards, and some international agreement is reached on maximum acceptable standards, it should not be interpreted as a discriminatory move against the exports of the developing countries. But action should be taken to cushion the disruptive effects of such measures on the trade of the affected countries through prior consultation, and the possibility of aid for adapting export industries in these countries to the new requirements (or towards a diversification of their exports) should be studied. The real danger is that the environmental standards enforced by the developed countries may be unrealistic and unilateral, or that the argument for better environment may be turned into an argument for greater protection by vested interests. When the concern spreads from the quality of a product to the environment in which such a product was produced, the alarm bells should ring all over the world.

Another fear of developing countries concerns the impact on economic assistance of the growing concern with the environment in the aid-giving countries. Aid donors may well believe that projects meant for environmental improvement should claim a fairly high priority in the developing countries, while the latter may give these projects a lower priority among their own competing needs. Development projects may be held up for screening of their presumed impact on environment if extensive guidelines for project appraisal are developed by the donors, as seems to have happened in the case of some recent hydroelectric projects. These projects may also become more expensive if much higher environmental standards are insisted upon than the developing countries would wish or can afford. By their very nature, environmental hazards and diseconomies are very difficult to measure or quantify, and there can be many different judgments on their importance in the design of a project. Hence the fear that there may be serious distortions in the allocation of aid

funds to various projects, along with higher costs, fewer projects and even greater delays in the processing of projects, resulting from the unthinking extension to developing countries of the donor countries' environmental concerns. It is imperative, therefore, that multilateral and bilateral donors not rush into the preparation of detailed guidelines for project appraisal from an environmental viewpoint without adequate consultation with the developing countries, and without providing adequate safeguards against arbitrary guidelines and undue project delay. Environmental considerations should be discussed between donor and recipients on their own merits, and without reducing the flow of aid.

Besides the flow and direction of aid, the kind of technology that is transferred from the developed to the developing world may be affected. Future technological developments in the developed world will no doubt be influenced by their current preoccupation with non-pollutive technology. To the extent that these developments are shaped by the environmental problems of the advanced countries irrespective of the conditions in developing countries, the technology which is transferred to the latter may become even more inappropriate than it often is at present. Some of this non-pollutive technology would obviously be quite costly for the developing countries. If such equipment is significantly more expensive than the present technology, its export to developing countries under tied credits will reduce the real content of foreign assistance.

All these are legitimate fears, but they should not be exaggerated. In any case, the best strategy for the developing countries is to articulate them fully, and then to seek opportunities to turn the environmental concern in the developed countries to their own advantage—or at least neutralize its adverse implications. There is, first of all, a prospect that the global concern for environment may reawaken the concern for elimination of poverty all over the globe. An emerging understanding of the indivisibility of the earth's natural systems on the part of the rich nations could help strengthen the vision of a human family, and even encourage an increase in aid to poor nations' efforts to improve and protect their part of the global household. For this, the environmental problem has to be placed in its proper perspective. It should not be presented as a pollution problem in the developed world and a poverty problem in the developing countries: instead it should be treated as a problem of the most efficient synthesis of developmental and environmental concerns at different stages of social transition. Furthermore, it must be emphasized in all international forums, including the Stockholm Conference, that it is for the developed countries to reassure the developing world that their growing environmental concern will not hurt the latter's continued development nor be used to reduce resource transfers or to adopt more protectionist policies.

The environmental concern can also be utilized for greater support for projects and programs in the social sectors. Traditionally, the aid-giving agencies have tended to frown upon such programs for their presumed low rate of return, at least in the short run. But investment in human resources is now catching the imagination of the donors. Programs in education, nutrition, public health, water supply and other social services are beginning to be regarded favorably. Here is another opportunity that can be grasped: developing countries can use the growing concern for social services in the developed world to escape from the tyranny of financial rates of return in traditional project appraisal, and seek broader international support for their social programs.

There may well be other opportunities. If there is a growing concern about the pollutive effects of synthetics industries, the present rate of substitution for natural products of the developing countries may at least tend to slow down. If there is a concern about the depletion of natural resources, opportunities may open up for re-examination of prices negotiated under long-term commodity agreements, and for renegotiation of concessions for minerals and oil. If there is a universal concern for global environmental problems, additional funds may become available from the developed world to combat these problems at an earlier stage in the developing countries. The main strategy should be to seize these and similar opportunities, to enlarge their scope and to build upon them the edifice of more beneficial international economic relations. Attitudes of isolationism and indifference will hardly help in a world drawn increasingly closer; the developing countries must articulate their own interests and insist on international arrangements to protect these interests.

In this context, we considered two major issues at some length: the opportunity for relocating industries with pollutive implications in the developing countries; and the possibility of setting up a Special Fund to finance the implications of the environmental concern for the developing world.

The enforcement of higher environmental standards in the developed countries is likely to raise the cost of production of several "pollutive" industries such as petroleum and chemicals, metal extracting and processing, paper and pulp. Such a development opens up the opportunity for the developing countries to move into some of these industries if their natural resource endowments create a comparative advantage in these fields. Such efforts should not lead to a discarding of environmental standards; but unfortunately this whole subject bristles with controversy. There are those who argue vigorously that there should be no export of pollutive industries from the developed to the developing world. There are others who believe, just as strongly, that the opportunity for a better geographical distribution of industries must be seized immediately irrespective of any

environmental costs. The elements of a sensible policy probably lie somewhere in the middle of these two extreme viewpoints. Firstly, industries regarded as pollutive in some advanced countries because of their more limited environmental carrying capacity may well not be pollutive, or much less so, in the developing countries where there is much less environmental pollution at present. Secondly, environmental standards and costs are likely to be quite different from developed to the developing world, so that the developing countries may still manage comparative advantage in some of these industries despite the adoption of certain environmental controls in conformity with their own requirements. Thirdly, there is no reason why the developing countries should permit foreign investment which comes to their countries into pollutive industries to escape the more stringent environmental standards back home if this results in a high rate of remittance of profits and even a lower net transfer of resources. In any arrangement that is made, it must be ensured that: a) foreign investment is on favorable terms and conditions, b) it adds to the net transfer of resources, and c) it conforms to the environmental standards that the recipient country wishes to impose. So long as these safeguards are provided, there is no reason why the developing countries should not increasingly specialize in those industrial fields which are going to become more costly for the developed world because of their growing concern with environmental standards.

We also discussed the question of who pays for the higher costs arising out of the environmental concern, and how the burden is to be shared between the developed and the developing world. Looking at the problem strictly from the point of view of the developing countries, it is quite clear that additional funds will be required: to subsidize research for environmental problems for the developing countries; to compensate for any major dislocations in the exports of the developing countries; and to cover any major increases in the cost of development projects owing to higher environmental standards. There was some discussion on how these additional funds should be provided, and a proposal was made that a Special Fund be set up specifically for this purpose. It was, however, felt that the consideration of a Special Fund was premature at this stage, and the additional funds could as well be channeled through the existing international machinery so long as they could be clearly earmarked for the above-stated objectives.

[Excerpted from "Development and Environment," a report submitted by a Panel of Experts convened by the Secretary-General of the United Nations Conference on the Human Environment, 4-12 June, 1971, Founex, Switzerland.]

Stockholm and the Developing Countries

Miguel Ozorio de Almeida

[Speaking for the interests of developing countries generally, Brazil's UN delegate notes that: the industrial countries are the main polluters of the environment; some scientists have exaggerated their threatening predictions; any implications of limitation on developing countries' populations or economic growth would be unacceptable. The Stockholm Conference has a valuable job to do if it focuses on the right problems.]

This is the last opportunity the General Assembly of the United Nations will have to give its orientation for the preparation of the Stockholm Conference on the human environment. What makes Stockholm necessary for all peoples of the world is the fact that there is a type of pollution of worldwide significance that is taking place and that, moreover, tends to increase at an accelerating rate. This pollution, it is thought, may eventually endanger life as we know it on our planet. Obviously something should be done about it, and because it is a global problem that touches upon the welfare and living conditions of all peoples the corrective measures to be undertaken will have to be of an international character and, hopefully, agreed upon at Stockholm.

This type of pollution of broad universal significance covers a rather wide range of activities and it takes place on land, in the air and in the seas. Besides the ten major known pollutants shown in Chart 1, there are others that either have a more localized effect, or whose working in the ecosystem is not so well known. Examination of this list of pollutants shows clearly that, with marginal excep-

Ambassador Ozorio de Almeida heads the Brazilian delegation to the United Nations, New York.

Chart 1: Major Pollutants

1. Carbon Dioxide (CO_2), normally the result of energy consumption in power production, in industry and in domestic use. Some believe the present accumulation of CO_2 at the rate of 0.2 percent per year might significantly increase the Earth's surface temperature and that this would not be a good thing.
2. Carbon Monoxide (CO), the result of incomplete combusion mostly in heavy steel industry, in petroleum refineries and operation of motor vehicles. It is poisonous to humans, and, some believe, may interfere with the photochemistry of the stratosphere, starting a chain reaction of untold processes.
3. Sulphur Dioxide (SO_2), the result of energy production, industrial activities, domestic use of coal and the operation of motor vehicles. Beyond certain concentrations it provokes respiratory diseases, damage to limestone buildings, to certain types of synthetic textiles and to vegetation.
4. Nitrogen Oxides (NO_n), originates in motor vehicles and aircraft, energy production, excessive fertilization of soils, forest fires and in waste disposal including dumping. This effluent causes metaemoglobinaemia in babies, eutrophication of lakes and oceans, production of smog and loss of aquatic life.
5. Phosphates, found in sewage and especially in detergents, in overfertilization of soils and as an effluent from intensive animal farming; contributes to eutrophication in water bodies and loss of aquatic life.
6. Mercury, results from certain processes of manufacture, mining and mineral refining, and the application of certain fungicides in agriculture and in the pulp and paper industry. It is a great contaminant of food, especially sea food, and it has a cumulative poisoning effect.
7. Lead, largely from automotive fuel; lead smelting, the chemical industry and pesticides are also large contributors. It is a cumulative poison that inhibits enzymes and impairs cell metabolism; it is accumulating in marine deposits and drinking water; the levels in fish may become dangerous.
8. Oil, originating in tanker operations (49 percent), wastes (22 percent), refineries (14 percent), accidents from ships (10 percent) and offshore production (5 percent). Some fractions of this substance are carcinogenic; it hurts sea birds, fouls beaches and threatens the tourist industry.
9. Persistent Organochlorine Insecticides like DDT, Aldrin, Dieldrin, Heptachlor, etc., mostly used in agriculture. Their run-off into the water provokes the loss of fish and their food. They contaminate food; may have carcinogenic effects, and reduce the population of beneficial insects.
10. Radionuclides, 99 percent are produced in nuclear fuel processing plants and the rest by nuclear accidents, weapon testing and nuclear powered ships. They contribute to increased genetic mutation; the amounts found in some foods, especially milk, can be dangerous.

tions, the great polluters are the highly developed industrialized countries. The overwhelming discharge of effluents is the consequence of technologies recently developed in industrial countries and of their high levels of economic activity, both in industry and in primary production, including overfertilized, overherbicided and synthetically controlled agriculture. The contribution to this type of pollution by underdeveloped countries is in absolute terms extremely small, and in relative terms practically nil. The significance of pollution is relative, not absolute: pollution of significance exists when the introduction of a substance into the ecosystem exceeds its ability to anul, compensate, neutralize, absorb or disperse it into insignificance. In that sense it could be said that if we could withdraw from the earth all pollution generated by the developed countries, there would be no pollution of worldwide significance; conversely, if we withdrew all pollution directly imputable to activities in underdeveloped countries in the world today, practically all dangers linked up to pollution would continue to exist in practically the same densities. The possible exception is the pollution originated in the human presence at low levels of income; I will come back to this point later.

Probable Results of Pollution
of Worldwide Significance

This is an area in which there has been a lot of para-or-pseudo-scientific extrapolation. And much of this extrapolation has been of a terroristic or brainwashing kind. We are threatened with the melting of the polar ice-caps, the subsequent increase in sea levels and the wholesale drowning of some of the largest cities and capitals in the world. We are threatened with the exhaustion of the oxygen reserve in the earth because of North American and European overconsumption of this useful gas, while certain effluents dumped into the sea are jeopardizing its algae oxygen producing ability. We are also told that the Brazilian occupation and utilization of the Amazon forest will eliminate its ability to compensate for American oxygen voracity. We are threatened with cancer. As you know, everything that may be used as an irritant to human tissues may produce cancer, and this goes from lovemaking to all sorts of organic and inorganic compounds. We are threatened with hunger; we are threatened with emphysema; we are threatened with poisons; we are threatened with numbers—such numbers that there will be less than elbow room, not on earth, but in our little already half-scuttled spaceship.

The sensible questions are: how probable are those threats and how long will they take? What do we really know about all these problems? One of the possible answers to these questions has been given by the Conference Secretariat. In a balance sheet that includes what are considered the twenty-one most important pollutants (including those in Chart 1), the state of knowledge about effects other than acute toxicity to experimental mammals is, in every case but one, indicated as inadequate. The one exception concerns heat, where global effects are indicated as probably unimportant.

Another answer could be induced from the very nature of most of the dramatic or terroristic predictions made. Let us take, for instance, the consequences of the accumulation of carbon dioxide and the melting of all the arctic ice. No index of probability is attached to this prediction. Our planet has already gone through great variations in temperature, and this much before modern industry and technology started tampering with its ecology. Each warming up period has been followed by a cooling-off tendency. On the other hand carbon dioxide accumulation is simultaneous with other effluents, mostly particles, that reduce solar radiations reaching the earth and thus tend to cool its surface and offset the heating effects of the CO_2. And finally it is necessary to indicate some kind of time for the whole process to take place meaningfully. If the predictions are for the next ten years, we should do something about it even before Stockholm; New York is just a few feet above sea level. If it is a matter for a hundred years, we may have time to improve our knowledge and thus

risk fewer mistakes in dealing with the subject. If one thousand years, the problem must be heavily discounted since it is totally inadequate to predict the burning of fossil fuels for such a long time. If one hundred thousand or one million years, let us forget about it. With a few exceptions, the same could be said about all problems already touched upon.

In most cases we have the isolation of one or a few cause-and-effect relationships which, taken outside of the proper background and compensating forces, lead to cariacatural extrapolations. Ecological science, the analysis of complex natural systems such as those now threatened by degradation, is of such a complexity, due to the enormous number and diversity of the interacting variables involved, that it is very difficult to prove or to refute anything. There is thus a body of ecologists who have felt free to escalate their threats and adopt an apocalyptic approach to public opinion. They claim that environmental deterioration is not merely a pressing threat to the quality of life today in certain highly developed countries, but to life itself on our planet. But the truth is that we do not yet know enough in order to pass judgments and take action in quite a few of the more important fields. This leaves us with a probabilistic outlook, namely, that quite a few of the threats now being made are illegitimate and another few probably true. But it is hard to tell one group from the other.

What should be done in those circumstances? We should forget the dramatization and use a little bit of good old common sense. 1) The first step should be to determine which cases of pollution have international significance and then, within the limits of available knowledge, determine the degree of probable urgency for action. It is quite clear that incomplete knowledge precludes drastic action in most fields. Some actions could worsen things instead of improving them, as happened in the case of smog clearance in Los Angeles, where efforts to reduce carbon monoxide in the exhaust of motor vehicles led to measures that provoked the equally harmful production by high-powered engines of nitrogen dioxide. Similarly, the banning of DDT and other persistent organochlorine insecticides could drastically increase malaria and reduce agricultural production in tropical areas. 2) The second step should thus aim at sensible improvement of the situation, as far as possible by reducing emission of the major sources of pollution and in areas where the carrying capacity of the environment has been clearly overtaxed. We have noted that the largest sources of pollution are found in highly developed areas, where the largest economic and technological resources necessary for the ability to act are also concentrated. 3) The third step should be to set up adequate research for all areas where danger seems to lurk, creating the appropriate basis for future action.

The conjunction of huge polluting activities with the ability to act entails obviously the responsibility to act. The whole world and, certainly, the underdeveloped countries, are looking at Stockholm as the place and time when the developed countries will commit themselves to taking all necessary steps to reduce or neutralize the emission of pollutants of broad international significance. This commitment should entail all the necessary national measures but also the financing of research in areas of world significance.

Other Types of Environmental Degradation

But the environmental problem encompasses many forms of environmental degradation both in urban and in rural areas. Of these perhaps the most relevant lie in the area of the irreversible loss of natural resources. The mere exhaustion of natural minerals is something to be deplored, but it is as irreversible as death itself. The development of civilization has proved that the dangers in this area tend to be overstated, and that the appearance of substitutes to vanishing materials more than offset their gradual exhaustion. A good example is the campaign in the 18th century to plant oaks in England in order to maintain the English shipbuilding ability, an effort that was amply superseded by the advent of iron and steel ship construction. Another case concerns the estimates of disasters that would follow the exhaustion of known coal deposits at the end of the last century; there predictions were not only refuted by the discovery of new deposits all over the world, but also made silly by the advent of new sources of energy like liquid fuels and atomic energy. What may be expected in terms of nuclear fusion and solar energy utilization in the next few centuries is so unlimited that the prophets of doom have abandoned this area. Malthus' expectations in relation to the linear progress of food production in marginal lands have been denied, so far, by facts. In this limited earth it will become true one day, but it was not true when the prediction was made and it is not true today. Truth, even scientific truth, has a time limit and a date.

A more relevant problem than mineral depletion to consider at Stockholm should be the irreversible but unnecessary loss of resources such as the extinction of plant and animal species. This is an area in which world cooperation is really indispensable and all necessary steps to preserve wild and domesticated gene pools should be taken. The proposals made by the Secretary General of the Stockholm Conference seem to go a long way in this direction. The problem again becomes a bit more complex in relation to other desirable characteristics of the environment, such as panoramic views and different natural or manmade aesthetic values. It is inadequate to pretend that certain values belong to mankind as a whole, when these values are located within national jurisdictions; and still more inadequate to try to reduce the degree of freedom of a national com-

munity to deal with its resources, aesthetic or otherwise, without creating, by international action and collaboration the necessary alternatives for action.

The Illegitimate Problems of Environment

We have a whole range of problems of a different nature: they are what has already been called the pollution of poverty, or of underdevelopment. In rural areas this type of pollution encomapsses mostly problems of sanitation, of food and water contamination, and the major pollutants are micro-organisms disseminated because of the lack of appropriate facilities for the disposal of sewage, night soil, etc. In urban areas we have the same problems and quite a few others linked to excessive urban densities at very low levels of income. The major characteristics of these types of pollution are: 1) they are essentially local in character; 2) they tend to be biodegradable, i.e., given appropriate space and time the environment will be able to cope with the foreign matter injected into it. 3) They tend to diminish with economic development itself, contrary to the prevailing conditions in developed countries. In fact it is impossible to correct this process of pollution without development, in part because one of the very definitions of development consists in not having this type of pollution, and in part because the resources necessary to cope with it are not available at low levels of income.

It is thus highly inappropriate to discuss these problems, both rural and urban, outside the framework of economic development. Any efforts in the direction of a solution of the pollution of poverty, unconnected to a process of resource accumulation through development, would be self-defeating, because of the diversion of resources to compensate for effects instead of tackling the real causes of the problem. If Stockholm must tackle this problem, then Stockholm must also become an economic development conference. If the Powers that called this Conference into being do not want it to tackle economic development problems, then let us keep this whole range of problems outside the scope of the Conference. What is not possible is to bring into Stockholm problems that are an integral part of the poverty and development equations and to deal with them outside of their basic framework.

There are other problems of environment degradation linked to poverty—problems of agricultural soil conservation and of different types of urban deterioration. These are essentially the result of the economic inability to act. In rural areas the prevailing conditions are based upon a fundamental lack of capital resources, be it of equipment or of inputs for the improvement or even the simple maintenance of soil fertility. The creation of the necessary conditions for improvement implies the initial ability to save, which is

very difficult to obtain at subsistence levels, and the creation of an industrial mix or import capability for supplying the necessary inputs. In urban areas most problems are linked to the inadequacy of industrial employment. This is the consequence of the non-adaptation of imported technologies to the factor endowment of underdeveloped countries where labor tends to be plentiful and cheap but is not being fully utilized within the framework of the internationally available technologies. All the proposals so far made for the solution of urban degradation in underdeveloped countries miss the core of the problem, which is technico-economic, and by concentrating on consequences and ignoring causes they will represent a serious diversion of resources from development and an inefficient attack on the problem.

Population growth. The implicit and the explicit approach of the Stockholm Conference to demographic problems have been far from acceptable to a number of countries. The underlying implicit assumption has been that, given the present demographic magnitudes and distribution in the world, and given the present patterns of consumption of resources and of emission of pollutants by the developed countries, the world cannot afford the economic development of the underdeveloped countries along the lines followed by the presently developed ones. If this three fourths of mankind could squander natural resources at the rates and within the per capita densities of the United States or Western Europe, there would not be enough oxygen to go around, and there would be so much carbon, sulphur and nitrogen dioxides as to push mankind toward total extinction.

So, three general basic measures are being proposed, some explicit and some implicit: 1) explicitly, the control of the populations of underdeveloped countries; 2) implicitly, a ceiling on the development of underdeveloped countries; 3) explicitly, a reduction of the emission of major pollutants by developed countries. To give logical symmetry—if not acceptability—to this scheme, a fourth proposal would be that overpopulated developed countries reduce their own demographic numbers and, if necessary, their industrial predation upon nature so as to reduce their claim on the natural resources of underdeveloped countries.

The notion of a ceiling—internationally arrived at—for the population of specific underdeveloped countries, and a ceiling for their economic development, are wholly unacceptable at this juncture, under the assumption that the populations and development levels of developed countries are taken for granted and not liable to discussion, change and correction. Such ideas are also not acceptable in the state of knowledge of the earth's human carrying conditions. The emphasis given to population growth as such, unlinked to a population's present dimensions in relation to its national resource basis including geographical space, is inadequate and unacceptable. De-

veloped countries with more than 100, 200 and even 300 persons per square kilometer are thus left outside this approach, while countries with less than twenty inhabitants per square kilometer are being implicitly and explicitly condemned for [expansive] demographic policies that would bring about increased economic efficiency and constitute a necessary condition for their national integration and fulfillment as a human community.

A final point I want to make concerns an undiscussed philosophy or assumption that has crept into the Stockholm framework of thinking, as it were, by the back door. It is the assumption of a universal right of all peoples to share in the earth's natural resources. These resources are not limited to the so-called common goods, like the high seas or the bottom of the oceans, but include the mineral, animal, soil and other resources within national boundaries. This is a very beautiful assumption, but it would fit better in the institutional framework of a world government, and we are still very far from this ideal. The United Nations is based on a world divided into national states with a high degree of sovereign rights over the resources within their borders. This is a fact of life that, until changed, must be kept in mind when dealing with problems relating to natural or any other kind of resources. If it were not so we would find ourselves in a highly unbalanced position were the still untapped natural resources of underdeveloped countries placed by the Stockholm Conference within a World Trust and thus at the disposal of the voracious industry and consumption of highly developed countries. Simultaneously the developed world, sheltered by its national boundaries, would keep basically unshared its economic power, its industrial productivity and its financial control of the international community, paying little more than lip service to the legitimate aspirations and needs of the underdeveloped countries.

It must be understood that it is either one universal framework for all sectors or a national framework for all sectors. If resources are shared, in trust by all peoples, then economic power, industrial productivity and financial control should also be shared. Since the latter is unthinkable by developed countries the former shall also be unthinkable by underdeveloped countries. Certain developed countries, with fantastic demographic densities that coupled with present characteristics of international trade and payments give them outstanding economic productivity, take for granted their right to the status quo. However, threatened by economic development in the third world and by demographic growth in Latin America and Africa, and believing that world resources taken as a whole would be insufficient to sustain both groups at high levels of income and consumption, these countries have implicitly and probably unconsciously supported action in Stockholm that would guarantee the perpetuation of their advantages. We believe that Stockholm should not be used for these purposes.

Stockholm has a simple and legitimate job to perform. It should, in a general way, strive to: 1) establish conditions for more research in critical areas of the environment; 2) congregate countries in national and international efforts and action to preserve options, and prevent the unnecessary loss of unrecoverable resources; 3) provide a better dissemination of knowledge in the broad area of environment. More specifically Stockholm should aim at: 1) a commitment by great polluters of worldwide significance to take measures to reduce pollution at the source, or to compensate or neutralize its effects wherever they are felt; 2) the formulation of measures for the acceleration of economic development of underdeveloped countries so as to: a) reduce the environmental degradation due to poverty; b) help to create additional resources for environmental rehabilitation along the process of development; 3) prevent the transfer of any part of the costs of environmental improvement in developed countries to the underdeveloped peoples.

[Excerpted from the statement delivered by the Brazilian Representative to Committee II, XXVI Session of the General Assembly on Item 47 of the Agenda, United Nations Conference on the Human Environment, 29 November 1971.]

Reply to Brazilian Statement by U. S. Delegate

I should like to allude briefly to a set of concerns relating to the Stockholm Conference and, more generally, the appearance of environmental issues on the agenda of world politics, which have come to concern any number of nations, my own included, and which were addressed today with great candor by the distinguished representative of Brazil. He spoke, as he ought to have done, of the fear that an "anti-developmental philosophy" would dominate the Stockholm Conference, and by extension, permeate world environmental efforts. He defined, with some clarity, what he termed "The illegitimate problems of the environment," problems, that is, which arise from poverty and underdevelopment and which can only be resolved by more development rather than by less. I should like to state with the same candor and explicitness that my Government is both cognizant of these concerns, and shares them. We would not got to a conference dominated by an "anti-developmental philosophy." We would not take part in any effort to retard development rather than to advance it. We are going to Stockholm precisely because we feel it is imperative that this extraordinary initiative by the society of nations move in the direction of greater rather than lesser development.

The distinguished Brazilian representative has suggested that "three basic measures are being proposed" in connection with the forthcoming Stockholm conference: "1) explicitly, the control of the populations of underdeveloped countries; 2) implicitly, a ceiling on the development of underdeveloped countries; 3) explicitly, a reduction of the emission of major pollutants by developed countries." This was an unfortunate statement. It is true that the Stockholm Conference must explicitly look to a reduction of the emission of major pollutants by developed countries. That is in large part what the conference is about; world society is making ready for such initiatives, indeed with the Nuclear Test Ban Treaty it has already taken a major step with respect to what was then our most urgent problem. But there is absolutely no intention—explicit or implicit—by any nation with which the United States is in communication, to control the populations of underdeveloped countries. There is absolutely no intention, implicit or explicit, to place a ceiling on the development of underdeveloped countries. There is not the vaguest notion of placing the resources of the underdeveloped countries in a "World Trust."

It was suggested that the developed nations are contriving a cunning and devastating scheme to use the issue of the world environment as a means for imposing controls on the growth of the population of the underdeveloped nations. The assumption here is that the security and comfort of the developed nations is somehow threatened by the propsect of population growth elsewhere. This could not be more wrong. All that would be necessary for the underdeveloped world to be reduced to permanent impotence and poverty would be for the current rates of population growth to continue. Now, there are exceptions to these trends—especially in Asia—which have been heartening to us all, but the general direction persists. Treble and quadruple your population, and you are likely never to be heard from again, save in occasional appeals for famine relief.

Similarly, the developed nations have nothing whatever to fear from the development of other nations, and something to lose if this does not occur. What will be lost is the shared increase in wealth which almost invariably accompanies the rising exchange of goods in international trade. There is little profit to be had from doing business with a poor country, for the simple reason that there is little business to be done. That is another brutal reality of the world in which we live. We can seek to mitigate that reality, to change it even, and the United Nations is doing at least something in that direction. But the United Nations and the world community are not likely to do more if the developed nations have to be confronted with the accusation that they are somehow opposed to development.

The discovery that industrialization could bring ecological imbalance, could lead to the exhaustion of raw materials, the destruction of many forms of life, the transformation of what economists used to call "free goods" into some of the most costly goods of all—this discovery has enlarged man's understanding of what a responsible society is like and what a responsible society does. It has vastly expanded our sense of the time span for which we must act as responsible guardians of the goodness of the earth. It has incredibly enlarged our realization of what it is we must understand if this responsibility is to be met. This is a change so great as to assume the proportions of a transformation of our culture. The distinguished delegate from Brazil spoke of the "common goods" of mankind—the high seas, the bottom of the oceans. It is a happy phrase, and one which we would hope might gain greater currency. For almost the first perception that followed the original discovery of the environmental problems of the earth was the perception that the great untouched resources of the seas ought to be held in common for the benefit of those most in need. Centuries hence it could well be that men will look back to this one idea as that which finally gave to mankind a common positive interest in advancing one another's welfare. It is no small venture that begins in Stockholm next June. It may be a larger one than any now suppose, or any will realize for many years.

[Excerpted from the statement delivered by Daniel P. Moynihan, U.S. Representative to Committee II, XXVI Session of the General Assembly on Item 47 of the Agenda, United Nations Conference on the Human Environment, 29 November 1971.]

Computer Curve to Doomsday

Claire Sterling

[A computer model has been devised which points to "crisis" results if growth rates in world population and production continue. It implies that there must be declines in these rates if disaster is to be averted. NOTE: The material presented below is highly controversial and its method of reaching conclusions has been severely criticized by numerous experts. Neither the Club of Rome nor Professor Forrester's work are connected with any of the governments participating in the Stockholm Conference; nevertheless, the emergence of the kind of thinking they exemplify has aroused some of the apprehensions expressed at the United Nations (see pp. 18-26 above).]

In the summer of 1970, Professor Jay Forrester of the Massachusetts Institute of Technology began a computer study to see how much longer the human race can go on multiplying and industrializing before the planet's environmental system breaks down. As described in his book World Dynamics [Cambridge (Mass.): Wright-Allen Press, Inc., 1971], his answer is: not long.

Professor Forrester is a pioneer in computerized system simulators, and one of several distinguished scientists working with the International Club of Rome. This particular simulated system of his is the first of its kind, a dynamic worldwide model tracing the effects of population, capital investment, geographical space, natural resources, food production and pollution upon each other, over a long span of time. For example, it is assumed that birth rates will be affected by: a "food-birth rate multiplier," a formula specifying how many

Ms. Sterling is a free-lance reporter living in Rome, Italy.

more births will take place in response to an increase of given amount in the world food supply (and also how the two would decrease together); a birth rate-crowding multiplier relating births to area per capita; a birth rate-pollution sensitivity indicator; and a birth rate-materials multiplier—all acting together to produce a world birth rate figure. Similarly, each of the other variables—capital investment, pollution, material resources, space, etc.—has a set of formulas relating it to all the other variables which are assumed to determine its rate of change. Future projections are made by putting all these interacting formulas together into the computer, and following the numerical results—that is, seeing where the combined growth rates will lead if continued over a number of years. This projection can be done either by using unchanged the existing growth rates from the past, or by changing one or two of these rates to see what would be the consequences of a policy which affected the particular rates—e.g., a birth control policy, or a change in investment rates.

A "crisis level" comes when growth has gone too far: too many people taking up too much of the land that ought to be producing their food, demanding too many manufactured objects using up too many raw materials and polluting too much of our land, air and water. When this happens, growth stops, either because people starve to death, or raw materials give out, or pollution surpasses liveable limits, or the stresses of overcrowding provoke war. World population could then drop by as much as a fifth in a single generation, while the bottom drops out of life as we know it for the rest of us.

And because the growth is "exponential,"—increasing at fixed rates of multiplication, e.g., doubling in a fixed period, rather than with fixed rates of addition in a given time—the crisis can sneak up on us before we know it. Exponential growth is treacherous and misleading, Professor Forrester says. Plotted on a statistical curve, it may seem negligible for centuries. "Then suddenly, within one doubling interval, the quantity grows from half the limit to the limit...in a mere instant of history, the upward-thrusting curve crosses the crisis level. Within one lifetime, dormant forces in the world system can exert themselves and take control...." Judging from the converging graph lines, that lifetime could easily be ours. None of the obvious measures springing to mind are likely to help much. In fact, the human mind simply cannot take this all in. Neither can the still primitive computer model. Nevertheless, Professor Forrester contends, this kind of computer model can foresee the consequences of an interacting group of forces more accurately than do the people involved in working with one or two elements of the system, and using their common sense.

For instance, we may think it simple common sense to get moving on planet-wide birth control. Far from helping, though, that could

make matters worse. A lower birth rate would mean more food and capital investment available per person. The telltale graphs say this would accelerate the pollution crisis and encourage a quick rise in the birth rate again to take advantage of the extra food. Other things being equal, a cut by as much as a third in the world birth rate (an improbably large reduction) would thus delay the "crisis level" by only 20 years.

Similar frustrations could be expected if we should look to technology for salvation, as usual. Let us suppose, as the computer model does, that scientists should find more substitutes for dwindling raw materials, or still more miraculous high-yielding varieties of wheat and rice, or more sophisticated ways to cut pollution. By Forrester's law, the first would encourage more capital investment and a higher birth rate, triggering the pollution crisis; the second would also lead to a higher birth rate; the third would again encourage more capital investment and a higher birth rate, which would in turn cause more pollution. The result is to allow population and capital investment to grow for another 20 years before the collapse from pollution occurs. The reduced pollution "solution" has thus, in effect, caused more people to suffer the eventual consequences. Meanwhile, the 10 percent addition to world population will have taken that much more land from the shrinking total available for agriculture. So if pollution wouldn't get us, starvation would.

Many other examples illustrate this circular process, whereby more and more people on the planet require more and more living space, manufactured goods, pollution dissipation and food which, if provided, invite the birth of still more and more people. The vicious circle can only be broken by two changes in the computer's equations: planned declines in industrial and agricultural investment, bringing population growth to a halt. In other words, our only practical option would appear to be a deliberate policy of anti-growth. This will doubtless shock those for whom growth of every kind, and of gross national product in particular, is "rapidly assuming the religious significance of a graven image," as the Duke of Edinburgh has put it.

Some of the implications Professor Forrester finds in his computer results are: ours may be a golden age, with a higher quality of life than the future offers. Rich industrial societies may be "self-extinguishing," pulling the average worldwide standard of living back to the level of a century ago. Poor countries may have no "realistic hope" of matching present living standards in rich countries, whose pollution and natural resource load on the world system is 20 to 50 times greater per person, since there are four times as many people in the poor countries. Poor countries may

be unwise to persist in industrialization. "They may be closer now to an ultimate equilibrium with the environment than industrialized nations....If one of several forces strong enough to cause a collapse in world population does arise, underdeveloped countries might suffer far less than their share of the decline because economies with less organization, integration and specialization are probably less vulnerable to disruption."

Talk like that is not going to make Professor Forrester very popular in poor countries, and he himself is the first to admit that such anti-growth policies are "counter-intuitive" to the point of being politically insane. Nevertheless, his simulated system points that way. Exponential growth cannot continue forever. There are many possible mechanics of growth suppression. Unless we understand and choose, the system by its internal processes will choose for us. We may then be "overwhelmed by a social and economic system we have created but cannot control."

Some knowledgeable people have been saying for years that an orderly transition from growth to equilibrium is the planet's only hope. The Club of Rome, a private body of some 75 reputable social scientists from all over the world, has undertaken a major research program to explore further a transition from growth to equilibrium and will soon bring out a study. [The Limits to Growth, published for Potomac Associates, Inc. (Washington, D.C.) by Universe Books, New York, March 1972.]

[Excerpted from "A Computer Curve to Doomsday," The Washington Post. Washington (D.C.): the Washington Post Company, 5 January 1972, p. A16. Copyright © 1972 by the Washington Post Company.]

The Study of Man's Impact on Climate: The Summary Report

[The Study of Man's Impact on Climate (SMIC), sponsored by the Massachusetts Institute of Technology, brought together 30 scientists from 14 countries in July 1971 to collect and organize for the Stockholm Conference the best knowledge available on the subject so far. No trends are established which seem likely to bring large changes in climate in the near future, but a great deal more needs to be learned before judgments can be made with certainty. The specific SMIC recommendations for further research, omitted here, were wide ranging.]

Previous Climate Changes

The climate of a locality is defined by long-term statistics of the variables of state of the atmosphere at that locality. Conventionally the climate is represented by the mean values and the variances of a long series (usually 10 to 30 years) of observations of those variables. There are local and regional climates and a planetary or global climate. The regions chosen are generally the natural geographical regions of the earth's surface. Short time variations of meteorological parameters entail "weather changes" while their long-term variations entail "climate changes." The climate may be considered as the sum of a set of weather types, each of these types having a characteristic frequency distribution over the averaging period.

Any general discussion of man's impact on climate should begin with a review of the observed fluctuations of climate not only during the period of instrumental observations (since about 1680) and the period of abundant historical, botanical, and geological data since the maximum of the last ice age (about 20,000 years ago) but also since the beginning of higher organized life on our globe about 550 million years ago. From the viewpoint of earth's

history, our recent climatic fluctuations, covering less than 300 years, are only small-scale noise, are seemingly random, and are certainly not well understood.

Perhaps the most significant lesson to be learned from the long history of our planet is that during more than 90 percent of this 550 million year period the earth was free of polar ice. In a sense, we live in an ice age, and this is an anomaly for our planet. During the late Paleozoic period, 250 to 300 million years ago, an ice age occurred which lasted 30 to 50 million years. Following this there was a long period without any polar ice, and then there was a gradual cooling that resulted in the beginning of the present antarctic glaciers during the Pliocene period, about 5 million years ago. The glaciers in the Northern Hemisphere apparently began much later, first in the Sierra Nevada of California and in Iceland about 2.5 million years ago, and soon thereafter in Greenland.

In this present era of glaciation which we define as the Pleistocene, there have been several periods during which large ice sheets formed over the North American and European continents. The retreat of these Pleistocene ice sheets took place only 8,000 to 16,000 years ago, so recently that its effects on the rocks and the distribution of soil are still clearly visible. A remarkable feature of this retreat is the relative abruptness with which it took place. Evidence from the Greenland ice sheet, which has persisted and preserved the record in the layers of snow that accumulated each year, suggests a rapid increase of the mean temperature by several degrees centigrade—just how many we do not know—during a 1000-year period at the end of the last ice age. For the last 10,000 years the temperature, as indicated by the Greenland snow, has been relatively constant compared with the earlier dramatic change. There have, however, been many significant smaller fluctuations such as the cold period in the 17th century that has been referred to as "the little ice age."

Since accurate thermometers became available we have been able to make more precise records of our climate, and we know that the mean temperature of the Northern Hemisphere (for which the better data exist) increased by about $0.6^{\circ}C$. from 1880 to 1940. Since 1940 it has fallen by more than $0.3^{\circ}C$. These mean differences are misleading, however, since temperature changes vary over the globe: in the last 30 years the changes in warming and cooling in arctic regions were three times larger than the mid-latitude changes, and in the tropics there was little change, possibly even a slight change in the opposite direction. While it is conceivable that man may have had a small part in the most recent climate changes we have just described, it is clear that natural causes must be sought. In fact, it will be difficult to identify any man-made effect because,

first, with our present state of knowledge, we do not know how to relate cause and effect in such a complex system and, second, man-made effects will be obscured by the natural changes that we know must be occurring.

Man's Activities That May Affect Climate

One of the most clearly evident influences of man on his environment is his pollution of the atmosphere. In cities the pollution is sometimes acute, but even in the most remote places in the world it is still possible to detect traces of man-made contaminants in the air. The resulting rise in the particulate load of the atmosphere can be attributed to both industrial activity and the burning of waste crops and vegetation that is a practice in many tropical areas. Particles scatter and absorb solar radiation, and also affect the outgoing infrared radiation from the surface, so these man-made products will influence the heat balance over wide areas. Some gaseous constituents of the atmosphere also absorb solar and infrared radiation; this category includes carbon dioxide (CO_2), water vapor (H_2O), and ozone (O_3). It is well known that the CO_2 content of the global atmosphere has been rising due to the burning of fossil fuels—coal, petroleum, and natural gas—and it is expected that it will go up about another 20 percent by 2000 A. D.

Until recently it has been assumed that man could not compete directly with nature in the release of heat on a large scale. Now, as we realize the implications of a doubling of the present world population of 3.6 billion by the year 2000, coupled with an expectation of more energy to be used per capita, we must take a further look. The production of energy of all sorts is rising at a rate of from 5 to 6 percent per year for the world. Eventually there may be industrialized areas of 1,000 to 100,000 square kilometers where the additional input of energy by man will be equivalent to the net radiation from the sun; and on a continental scale the present insignificant contribution may rise to 1 percent of the continental net radiation average after about 40 years.

We have spoken of some of the effects of industrial activity, but for thousands of years before the Industrial Revolution agricultural and animal grazing practices have had a profound influence on large regions of the world, and it seems very likely that these have already resulted in changes of climate of those regions. Grazing by goats and other domestic animals has reduced parts of Africa and Southwest Asia to semideserts; dense forests of the mountainous areas from Turkey to Afghanistan and of the Mediterranean, Europe, and the eastern United States have been cut down to make arable or grazing land; and the savannah grasslands of the tropics are nearly all man-made. The net result is that some 20 percent of the total

area of the continents has been drastically changed, with a consequent change in the heat and water budget. In arid or semi-arid areas the growing demands for water for irrigation have reduced the reserves of ground water, and the process of irrigation increases the water vapor in the air.

Man also influences climate by manipulating surface waters: building dams, creating lakes, draining swamps, and diverting rivers. Artificial lakes, for example, will alter the heat balance of the area because water has a lower albedo than land; it has a much greater heat capacity, and it adds water vapor to the air. (Albedo is the percentage of incoming solar radiation directly reflected outwards by a planet or region.) Perhaps the diversion of rivers from one region to another has even greater potential implications, since the water so diverted will convert substantial dry desert or semidesert areas to irrigated farmland, and three-fourths to nine-tenths of irrigation water is evaporated in the air.

Control of river discharge into ocean areas that are subject to winter freezing could influence the rate of freezing or melting. Such activities coupled with intentional dusting of sea ice to hasten its melting could have serious regional and even global repercussions. Changing precipitation by seeding clouds with freezing nuclei has been sufficiently attractive to encourage the practice throughout the world. [See Development Digest, January 1972, pp. 79-84.] Any change in precipitation pattern influences the heat budget of the atmosphere; therefore, widespread seeding operations, including efforts to change the course of hurricanes, may modify the normal patterns of rainfall and snowfall enough to have an influence on the heat budget of a part of the atmosphere.

Finally we come to one of the most rapidly escalating activities of man, transportation. Automobiles contribute approximately half of some air pollutants observed in U.S. cities, and the same is true in most other industrialized countries. Since the automobile exhaust forms "smog" particles, this is a major contribution to the particle increase that we have already discussed. It is also interesting to note that roads in the United States cover nearly 1 percent of the entire area. This is not as big a change of land use as that due to agriculture, but is not entirely trivial. Aircraft also produce exhaust products, and it is currently estimated that commercial aviation will double its jet fuel consumption every five or six years in the next decade or so. Jet exhaust products are deposited high in the troposphere or the lower stratosphere. There are indications that jet traffic has already caused a small increase in cirrus cloudiness in heavily traveled areas, and this will have a small effect on the heat balance of the atmosphere. The supersonic transports fly in a region where the average residence time of their exhaust products is one or two years, so there is a chance for the concentration to build up.

In speaking about the future of man and his climate we are faced with two important areas to consider, meteorological (or geophysical) and social. Whereas we do have a rudimentary theory of climate and a good deal of knowledge about how things behave in the physical world, when we turn to a forecast of man's behavior we must resort to simple extrapolation of present trends with only slight shadings to take account of the more obvious interactions that we can foresee. There are no laws that we know of—or mathematical models—that will allow us to predict the future course of human affairs better than such extrapolations. Therefore we can in the end only forecast what could happen if mankind proceeds to act in a certain way—more or less as it is acting now.

Present Theory and Models of Climate Change

Climate is determined by a balance among numerous interacting physical processes in the oceans and atmosphere and at the land surface. If we are to assess the possibility and nature of a man-made climatic change, we must understand how the physical processes produce the present climate and also how past changes of climate, clearly not man-made, have occurred. Several physical-mathematical techniques—called "models"—are being developed to attack the problem. We have distinguished four types: a) "global-average" models, in which horizontal motion of the atmosphere is neglected; b) parameterized semi-empirical models which consider the whole atmosphere and surface but simulate some of the effects of atmosphere and oceanic motions with the aid of empirically adjusted constants; c) statistical-dynamical models in which physical laws are applied to statistics of the atmospheric variables; and d) explicit numerical models in which motions and interactions are treated in detail by integrating mathematical equations expressing the time rates of change of the variables—though in practice the detailed treatment must be abandoned at some minimum scale of motion and replaced by empirical parameterization (b) or statistical methods.

The global-average models serve the purpose of identifying and investigating in a preliminary way problem areas of concern to climate theory—for example they have been used to make first estimates of the effects of changing CO_2 content. The semi-empirical models allow consideration of problems of climate. There may be some uncertainty about their indications because we do not understand in detail the processes we have expressed by parameters, or the consequences of parameterization; nevertheless, their predictions must not be ignored, particularly if, as is often the case, the indications of independently developed models are similar. Statistical-dynamical models are in an early stage of development, but it is hoped that they will at some later stage obviate some of the enormous and costly computational load associated with ex-

plicit numerical models. Significant progress has been made in developing these detailed models, enough to give an appreciation of the difficulties and confidence that they might be overcome. We know enough now of the theory of climate and the construction of climatic models to recognize the possibility of man-made climatic change and to have some confidence in our ability ultimately to compute its magnitude. Recent results obtained using empirical models have in our view increased the urgency of the study of climate theory in its own right. Some of these results, for example, concern the delicate balance of the processes which maintain the arctic sea ice. The empirical models suggest that a small change in mean air temperature or in solar radiation reaching the surface could bring a considerable expansion or contraction of the ice pack—a climatic change of great significance to human life. This in our opinion reinforces the urgency of studies of climate by all available methods in order to understand its natural and possible man-made changes.

Modification of the Lower Atmosphere

Man's activities are increasing the number of particles in the lower atmosphere by adding them directly and by adding gases such as SO_2 which react in the atmosphere to form particles. By burning fossil fuels he is also increasing the CO_2 content of the atmosphere. We also suspect that man's activities may be changing the cloudiness of the atmosphere in a significant manner, for though this is not yet definitely established it is obvious that there are local man-made clouds. Studies, particularly some using "global average" climatic models, show that particles affect the climate through two major processes. They directly affect the transfer of radiative energy in the atmosphere, and they modify the properties and the processes which lead to rain and snow. Changes of CO_2 content also modify the transfer of radiative energy in the atmosphere, and we will discuss this later.

The extent to which present and potential man-made changes of atmospheric composition have a significant effect on the climate is still in doubt, because of gaps in our knowledge of the magnitude of the man-made change, of the processes of emission, transformation, and removal which regulate this magnitude, and of the relevant physical and chemical properties of the added material. There is a considerable population of "natural" particles in the atmosphere, a fact which complicates attempts to estimate man's contribution. We find wide divergences in current estimates of the total particle population, of the proportions existing in various geographical locations, and in the contributions from the various sources. We are not able to resolve these divergences. We find there is insufficient knowledge of the optical and chemical properties of the particles to allow full use even of the diagnostic "global average" models of climate,

and there are insufficient observations of the radiative properties of polluted atmosphere to allow verification of the results of theory and computation. However, calculations based on reasonable estimates of refractive index and particle content indicate that low-level layers will cause a net cooling.

Cirrus clouds can have a very important influence on atmospheric processes. We find that little is known about the formation, persistence, and optical properties of cirrus clouds, and that we are unable to estimate the extent to which they might be affected by man's modification of the atmosphere, for example, by the contrails (trails of condensation) created by jet aircraft.

We find the situation in regard to the effects of CO_2 on climate a little clearer than for particles. Evidence which has appeared since the SCEP study [a similar conference in 1970 of 70 U.S. scientists reported in: Man's Impact on the Global Environment, MIT Press, 1970] appears to confirm that the rate at which CO_2 is being accumulated in the atmosphere fluctuates, although the average increase continues to be about 0.2 percent per year. Thus, the natural processes which regulate the proportion of man-made CO_2 which remains in the atmosphere must vary in effectiveness from year to year. We agree with the conclusion of SCEP that these should be studied, but we are less ready than was SCEP to recommend specific measurements. More detailed preliminary examination of how CO_2 is allocated between ocean and atmosphere is required before a continuing measurement program for the CO_2 content of ocean waters can be recommended.

We have reconsidered the question of the oxygen content of the atmosphere in light of the material published since the SCEP study, but see no reason to modify the SCEP conclusion that there is no danger of significantly depleting atmospheric oxygen as a result of burning fossil fuels.

Effects of Man-Made Surface Changes

We have considered those aspects of the interaction between the atmosphere and the surface of the planet which play a part in controlling the climate in the context of both natural climatic changes and of the possibility of intentional and inadvertent interferences by man. The most sensitive surface state appears to use to be the ice and snow, particularly arctic sea ice, because of the large change of albedo accompanying a change in its area and the relative ease of its modification. Inadvertent change in the next four decades will mainly be of regional importance. However, over the only somewhat larger time scale of the next century we recognize a real possibility that a global temperature increase produced by man's

injection of heat and CO_2 into his environment may lead to a dramatic reduction or even elimination of arctic sea ice. Further, there is a possibility that deliberate measures to induce arctic sea ice melting might prove successful—and might prove difficult to reverse should they have undesirable side-effects.

The arctic sea ice illustrates the sensitivity of a complex and perhaps unstable system which man might significantly alter over the next few decades by making relatively small modifications in the earth's present heat balance. Some models indicate that a few degrees centigrade change in average temperature of the Northern Hemisphere might begin a melting of the arctic sea ice. Some studies indicate that large areas of open arctic sea would then tend to cause melting of the remaining sea ice, with the eventual result that it would disappear entirely. Once gone, it probably would not readily freeze over again. The melting of the arctic sea ice would not affect ocean levels. The changes in climate which would occur after the arctic sea ice melted are unknown, but they might be large—especially in the Northern Hemisphere—and include changes in precipitation, seasonal temperatures, wind systems, and ocean currents. The possible effects on the land-based Greenland ice cap (the melting of which could appreciably raise the level of the oceans) are likewise unknown: whether it would grow because of an increase in precipitation or begin to melt, and how long it might take for such changes to occur—although we believe any such changes would take many centuries. A start has been made in studying the sensitivity of arctic sea ice to temperature changes by the use of models.

With respect to man's impact on land surfaces, we have considered possible effects of the heat release resulting from all man's activities in energy conversion. "Useful" as well as "waste" energy eventually finds itself heating the environment. We believe that significant changes are possible on a regional scale in the near future; on the local scale, man's influence is already very large. Local and regional scale effects can be studied by existing climatic models.

Finally, we have considered man's manipulation of ground water and his use of surface waters. These produce large local climatic changes, for example, when an irrigated region becomes cooler. On a global scale the effects are principally upon albedo and upon the amount of evaporation which takes place. We suggest that these effects could be studied with the use of existing models, but it seems that most of the work remains to be done. The climatic impact of deforestation of tropical jungle, which seems to result in sharply reduced evaporation and increased local heating, particularly requires study. We note that "mining" of fossil ground water is leading to loss of a non-renewable resource, and note that this and inadvertent tapping of other ground water supplies may be depleting them to the extent that they may be causing the recent rise in sea level.

Modification of the Stratosphere

The region of the atmosphere from about 15 to 50 km. above the earth is the stratosphere; below it is the troposphere. For the first time in history man now can put material such as water vapor, nitric oxide, other gases, and particles from the exhaust of high-flying aircraft directly into the stratosphere in the form of combustion products. The SCEP analysis of the climate consequences of these products using figures for assumed SST (supersonic aircraft) fleet size, operations, and engine emissions concluded that:

1. There may be an increase in stratospheric cloudiness in polar regions in the winter but neither the amount of the change nor the consequences to the climate are known.

2. Radiative effects due to locally injected amounts of carbon dioxide, carbon monoxide, water vapor, and nitric oxide would be small compared with those due to other man-made sources of these gases.

3. The sulfur dioxide, hydrocarbons, and nitric oxide would produce particles which may play a role in the atmospheric heat balance as they do when introduced by volcanoes, but the consequences for surface temperature are unknown.

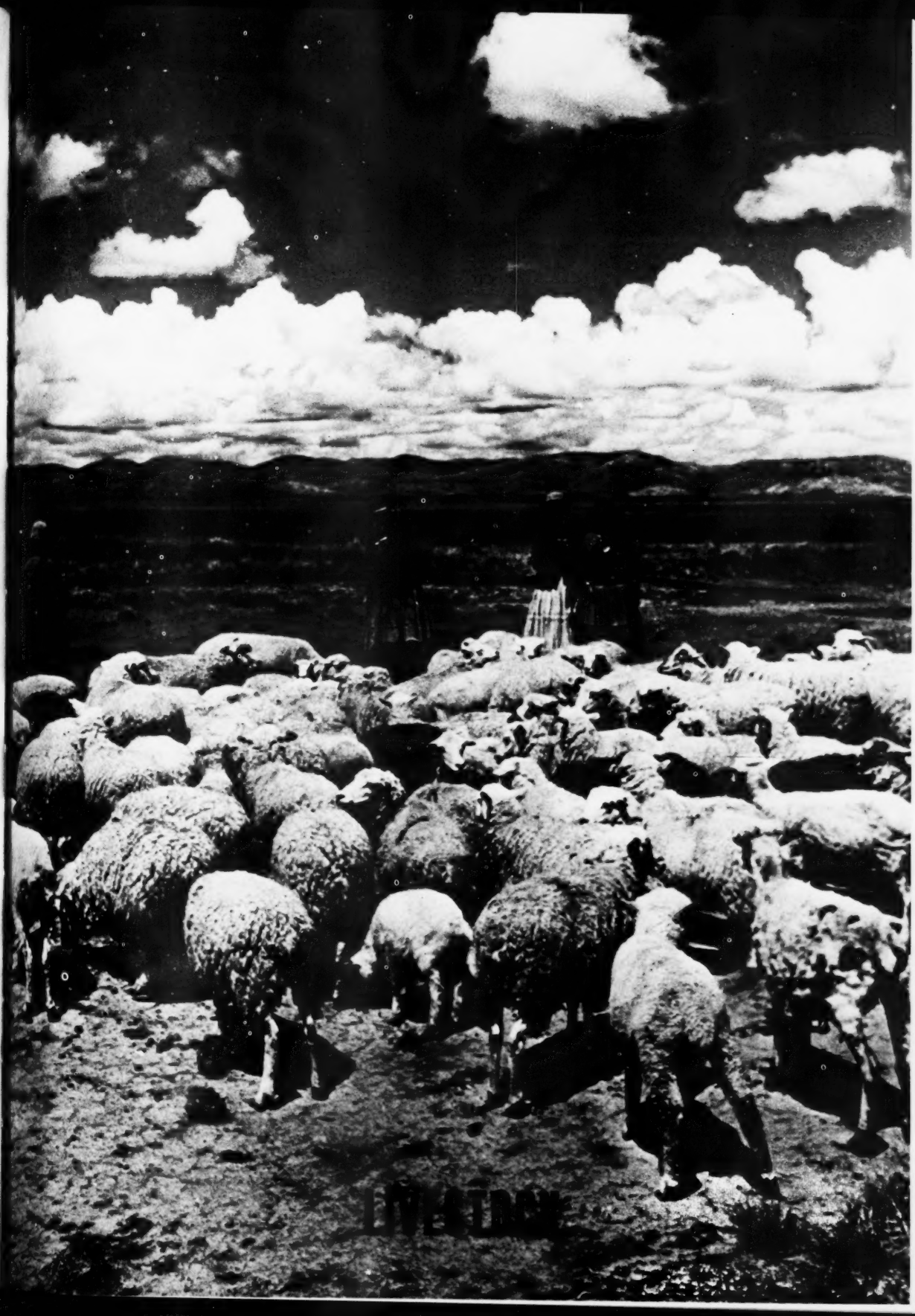
4. Ozone changes will be small compared with the present day-to-day and geographical variability of total ozone.

No new information has been developed to appreciably alter the SCEP judgment on these issues.

Since SCEP, the role of decreasing ozone and consequent increasing ultraviolet radiation which may damage life including man has been emphasized in public discussions. Ozone in the stratosphere is important: it partly controls stratospheric temperature and shields life on earth from harmful ultraviolet radiation. The ozone concentration in this region is maintained by balance between several competing chemical reactions and atmospheric transport processes. There is uncertainty about some of these reactions and in the complete understanding of the transport processes involved. Nor do we know much about the upward movements of products from the lower atmosphere which might affect ozone concentrations. Ozone concentration measurements at many places in different parts of the world have shown upward trends during the past decade. These are believed to be natural fluctuations, but we cannot explain why they occur nor be certain that transport of man-produced materials from the troposphere has not had some effects. Present data and knowledge do not permit any firm conclusions as to the effects of

SST combustion products on ozone concentrations in the stratosphere. We believe that answers to these questions should be produced by concentrated research before large-scale aircraft operation in the stratosphere becomes commonplace.

[Excerpted from the Summary Report of the SMIC Conference, Carroll L. Wilson and William H. Matthews, Director and Associate Director, respectively; Stockholm, June 28 to July 16, 1971. Full report published as Inadvertent Climate Modification, Cambridge (Mass.) and London: The Massachusetts Institute of Technology Press, 1971.]



HERD OF SHEEP IN THE MOUNTAINS OF BOLIVIA
[PHOTO: FOOD AND AGRICULTURE ORGANIZATION
OF THE UNITED NATIONS]

The Role of Animal Agriculture

U. S. Agency for International
Development (AID)

[Productivity of animal agriculture should be as responsive to scientific and technical improvement as crop farming, but much less progress has been made in programs of assistance to livestock in developing countries. Some reasons for this are examined, along with suggestions for change.]

Animal agriculture is a major component of the rural sector in virtually all less developed countries (LDCs). Livestock product meat, milk, and eggs for human diets; they are prime sources of power in some farming regions, or are beasts of burden; and the dung is used as fuel, or as fertilizer for crops in other regions. Ruminant types of livestock (cattle, buffalo, sheep and goats) have other important functions; they are the principal means by which man makes effective use of permanent grasslands where rainfall is too low or uncertain for dependable crop production, as well as effectively utilizing lands that are too steep or stony for crop production but which will support growth of forage plants. Ruminant livestock convert all such forage into nutritious foodstuffs needed for balanced human diets. Also, the growth of forage plants, used either as pasture or harvested forage, provides a soil-building or conservation component of farming systems where tilled crops are important. [NOTE: this report deals with ruminants, excluding non-ruminant livestock such as pigs and poultry which rely on processed feeds or kitchen wastes.]

The importance of ruminant livestock in the agriculture of tropical and subtropical regions is indicated in Table 1. Since ruminant livestock are the prevailing means of utilizing permanent grasslands to produce human food, it is significant to note the extent of such grasslands relative to the arable lands

used for crop production. Except in Asia, permanent grasslands greatly exceed all arable lands. Data are not yet available on what proportion of total livestock support comes from the arable lands; it appears that all of the permanent grasslands, and as much as 1/4 of the arable lands, are utilized by ruminants to produce foodstuffs for the human population.

Table 1: Ruminant Livestock for Meat Production in Selected Countries, by Regions

Category	Central Am. & Caribbean (7 countries)	South America (8 countries)	Asia* (13 countries)	Africa (25 countries)
Arable Lands (millions of hectares)	6	51	118	158
Permanent Grasslands (millions of hectares)	8	200	44	464
Total Ruminant Livestock (millions of animal units: 1 unit = 1 cow, 1 buffalo, 5 sheep, or 5 goats)	10	154	135	140
Total Human Population (millions)	18	134	403	239
Red Meat Production (thousands of metric tons)	230	2,812	1,391	1,940
Kilograms Red Meat (per person, per year)	13.0	21.0	3.4	8.1

*Omitting India, where red meat production is not an accepted agricultural enterprise.

Historically, the livestock production from permanent grasslands of LDCs has entered export trade as the movement of live animals, with little or no movement of either fresh or processed meats. The extent of internal trade in livestock commodities and amounts of direct family food support provided to the producing herdsmen and farmers have been meagerly documented, and can only be estimated by very indirect procedures. Nevertheless, it is obvious that livestock carried on permanent grasslands must have substantial significance in the total agricultural economy.

In crop farming areas ruminant livestock utilize village communal grazing lands and they consume crop wastes (stalks, straw, vines, etc.) on tilled fields. Also, they graze roadsides and vegetation on areas too stony, steep, swampy, or droughty for crop production. These livestock provide limited but continuing supplies of milk for direct home use, and some intermittent supplies of meat. Sheep and goats tend to predominate as ruminant types in villages of crop farmers. In the vicinity of larger population centers, such livestock production has entered into commercial agriculture.

The present level of efficiency in livestock management in less developed regions is quite low. A number of valid field trials in various tropical and subtropical regions have demonstrated that productivity of ruminant livestock enterprises may be increased three or four fold. The full potential value of livestock can only be estimated, however, until there is more research and field testing in representative ecological regions. Data on the actual yields of red meat from all ruminants indicate that they are important contributors to total food supplies. Red meat per capita produced annually ranges from 3.4 kilograms for Asia to 21.0 for South America. These values are fairly well correlated with ratios of permanent grasslands to arable (cropped) lands in the countries with greater areas of permanent grasslands.

The nutritional value of red meat as a source of protein warrants special consideration. Infants and growing children require more animal protein per unit of body weight than adults to support normal growth and development. Human diets for adults should provide about 70 grams of protein per person per day, of which about 20 grams should be of animal origin to supply sufficient essential amino acids (particularly lysine, threonine, methionine, and tryptophan), that are generally deficient in plant proteins. High protein oil seed meals (soybean, cottonseed, peanut) are deficient in methionine, as are the foodgrain legumes (beans, peas, cowpeas, chickpeas, etc.). In the cereal grains, corn is seriously deficient in lysine and tryptophan, wheat is deficient in lysine, and rice is deficient in lysine and threonine. While some progress has been made in breeding for better protein quality in corn and wheat, animal proteins will continue to be important for supplementing human diets in the foreseeable future.

Animal Agriculture in Ecological Zones

The effective application of science and technology to animal agriculture, will require specific adjustments to ecological conditions. This is necessary because of the effects of the environment on feed production and on different types of animals. Grave mistakes have sometimes been made by agriculturists from developed

countries in attempting to transfer the practical experience and temperate zone livestock breeds directly to the tropics, with resulting failures.

Tropical climates are unique in being comparatively warm to hot throughout the year, and in having daylengths of approximately 12 hours at all seasons. Subtropical regions have one cooler season with shorter daylengths, but are otherwise much similar to tropical regions in climate. The following major types of climate may be distinguished:

a. Tropical humid zones have 80 or more inches of rainfall yearly, well distributed, with no pronounced dry season; they are constantly hot and humid. Tropical humid regions occur in the Amazon basin of South America, in the Congo Basin and Guinea Coast of Africa, in the southern Philippines, Indonesia and New Guinea, and most of Malaysia. The native vegetative cover consists of trees and other jungle growth; and both farming and stock raising are based on cleared lands. The limited production of forages accounts for the very minor use of ruminant animals. The animal diseases and parasites that afflict ruminants in these regions are better tolerated by indigenous types of livestock than by temperate zone breeds; and livestock enterprises should be based on improved management of animal types suited to the tropics. There is no great problem in producing forages for livestock; but research is needed to demonstrate that livestock nourished on forages provide net returns equal to crop farming.

b. The monsoon climate is characterized by seasonal differences in rainfall. Usually there are three seasons; cool and dry, hot and dry, and hot and wet. In northeast India and East Pakistan, the annual rainfall ranges from 40 to 80 inches yearly, but it occurs exclusively in the summer season, and the other seasons are dry. This type of climate occurs also on the northern coasts of Haiti and Puerto Rico, the northeast coast of Brazil, the Guinea coast of Africa, and parts of Ceylon, Thailand, Malaysia, Cambodia, Vietnam, the Philippines, and northeastern Australia. The total annual rainfall is often as high in monsoon climates as in the equatorial climate, and the temperatures in the hot periods are as high. Livestock in monsoon climates are subjected to heat stresses and health problems similar to those in equatorial climates, and there is the same need to utilize indigenous animal types that have some tolerance to these stresses. Livestock production is particularly affected by the dry seasons when there is little forage growth, which makes it necessary to provide feed reserves to support stock in these periods. Crop farming has predominated in these climate zones from ancient times.

c. The subhumid regions, with yearly rainfall of 20-40 inches, have a climate that permits some crop production in the season of the year when most of the rain occurs, but the most dependable type of agriculture is based on ruminant livestock. However, mixed crop-livestock systems of farming are feasible wherever suitable arable soils occur. The native vegetation is predominantly grass, where man has not tilled the land for crop production. These areas include much of the western half of the Indian sub-continent, much of East Africa, and a broad belt from east to west south of the Sahara; and parts of Northeast Brazil, North Venezuela, Northern Argentina and most of Paraguay. They also include a broad belt on the eastern and northern sides of Australia. (There are transition zones between the humid and subhumid zones in India, Central Africa, and South America.) Ruminant livestock are important throughout all permanent grasslands of the topics. The use of indigenous types of cattle, sheep and goats that are adapted to the climate, somewhat tolerant of endemic diseases and parasites, and capable of utilizing native forages, is quite important to success with animal agriculture in these regions. The paramount problems in production are dependable supplies of stock water through the rangelands, and grazing practices to insure adequate supplies of dry standing forage (or harvested feeds) to carry stock through prolonged dry seasons when no plant growth occurs.

d. The semiarid regions with 10 to 20 inches of yearly rainfall cover extensive areas of the Middle East, much of Somalia and a belt adjoining the Sahara, as well as a broad belt of Australia surrounding the arid interior. This zone has all of the limitations of the subhumid zone, but to a greater degree. Any crop production is limited to irrigated areas. The native vegetation consists of a sparse cover of grasses and shrubs that are sources of feed for the hardier breeds of indigenous cattle, hair-type sheep, and goats. The animal types must be tolerant of the stresses resulting from heat, limited stock water, forage of low quality for much of each year, as well as endemic diseases and parasites. Grazing livestock provide the principal or only method of using these lands for support of man, and even though the yield per hectare is relatively low, the total contribution of these areas to meeting food needs is quite substantial.

e. The arid regions, with less than 10 inches of yearly rainfall occupy most of the Arabian Peninsula, parts of Iran and Afghanistan, the vast Sahara region from about 15° N. latitude to the Mediterranean, the eastern portion of Somalia, and the great central basin of Australia. Despite the limited and uncertain rainfall, the generally high temperatures and very sparse vegetation, these areas do support nomadic people who subsist on camels, hair sheep, and goats, though it is a high risk occupation. Livestock and range

management are important to the millions of people in these desert regions, and the application of modern science and technology has demonstrated the feasibility of increasing productivity of desert ranges by 1 to 2-fold.

Technical Assistance for Animal Agriculture

Many efforts have been made to improve the production of meat from cattle, sheep, goats and buffalo. For the most part, technical assistance projects have dealt largely or exclusively with a single constraint believed to be limiting efficient production. In broad categories, these constraints were: 1) animal diseases, 2) feed supplies and nutrition, 3) animal breeding and improvement, 4) animal husbandry or management, and 5) the many aspects of economics and marketing. Since any one of these constraints may prevent benefits from flowing out of a useful activity, the best assurance of success with a livestock program is to deal systematically with all potential limiting factors to prevent any of these from becoming a barrier to progress. Thus, the successful control of rinderpest disease may have little value to livestock producers if other limiting factors are inadequate, such as feed supply or market facilities.

There are practical limitations on the usual approach to increasing the productivity of animal agriculture solely by improved technology. These derive in part from the unwillingness of livestock growers to accept and substitute new technology for traditional methods. In the absence of forced compliance, the willingness of growers to accept new technology is partly determined by economic incentives; moreover, the new technology should clearly reduce the hazards of economic losses to the producer, or he is not likely to respond to proposed changes. Degrees of acceptance are also influenced by social, religious and cultural patterns. Where rural traditions are derived in part from isolation, geographic location and historical patterns, these strongly affect the responsiveness to proposals for technological change. Programs of technical assistance to livestock farming must therefore be suited to local conditions in different countries or regions.

Some of the common problems in the past have been: 1. An overemphasis on breeding programs without sufficient recognition of the inherent adaptation to regional conditions possessed by indigenous animal types, and the lack of adaptation of European and North American breeds to tropical conditions. There has been a desire to develop new breeds for specific locations and conditions by importing exotic breeds or by artificial insemination programs. Very often these programs failed to explore the possibility of improving indigenous stock; and the basic genetic principles for using exotic breeds, along with such considerations as the population numbers, selection practices, and generations needed to fix desired traits,

were either misunderstood or neglected. Except for higher altitude areas (above 6,000 ft.) cattle adapted to temperate zones of the world have not produced lasting benefits in the tropics. More progress could be made by importing and/or interbreeding strains from among tropical areas, e.g., from Africa to Asia and vice versa.

2. There have been great difficulties in transferring production technology to the livestock grower, even when demonstration farms were established, because technology has not been offered on terms that growers understand. There has been a serious lack of knowledge on forage production (both grazing lands and harvested forage) that is feasible in each region, and of the better methods of utilizing the forage for sustained feed supplies. Also, there has often been overemphasis on using the feeding systems and feedstuffs familiar in the developed countries, rather than exploiting the forages and feedstuffs available in the LDCs. More information should be gathered on the tropical forage species and the nutritive quality of the tropical feedstuffs.

3. The problems of disease control, of malnutrition, and of managing reproduction to insure an annual calf crop (or lambs, or kids) so that the annual off-take of marketable animals will offer an opportunity for net profits, all need to be better understood. Little or no attention has been given to the universal problem of taking milk from the dam for home use and the consequent stunting of the calf, so that herds are largely made up of mature but stunted animals incapable of responding to the whole range of improved management practices.

4. Marketing requirements and production technology have not been sufficiently tied together. Unless market prices, practices and facilities are designed to give the producer a favorable net return on his animal enterprises, technical assistance is unlikely to succeed. The object of government regulations is often to keep prices of animal products at a low level to benefit poorer people in urban areas; but the end result is to discourage livestock producers. The government's role in statistical reporting of livestock offerings, slaughter, and meat supplies is often inadequate, or ineffective in producing an efficient marketing system that would be equitable for both producers and consumers without excessive levies or charges by the echelons of the meat industry. Where wasteful or extortionate marketing practices prevail, there is little benefit from assistance that is limited to production technology.

[Excerpted from a Technical Discussion Paper (unpublished), Agricultural Technology Division, Technical Assistance Bureau, AID, September 1971.]

LIBRARY
EASTERN MICHIGAN UNIVERSITY
YPSILANTI
U. S. DEPOSITORY DOCUMENT

A Challenge to Ruminant Agriculture

P. A. Putnam, L. A. Moore and N. D. Bayley

[Obtaining protein for human diets by consuming meat and milk from animals which feed on grains is often considered a wasteful use of the grain proteins. But current technology makes possible efficient protein production via livestock which can actually enhance the proteins available for human food, and further increases in protein generation are possible through research.]

Diets of most people in heavily populated countries are protein-deficient, and the deficiency is becoming critical as the population increases more rapidly than food supplies. To alleviate the protein needs, it has been suggested that animals must be by-passed as inefficient and unnecessary luxuries as far as dietary protein is concerned. It is frequently pointed out that the conversion ratio of plant protein into animal protein by livestock consumption ranges from 4:1 for sheep to 10:1 for cattle, implying that it is wasteful to feed plants to animals rather than consume them directly. Altschul, for example, proposed four solutions: a) improve plant protein quality genetically; b) supplement plant proteins with amino acids; c) utilize exotic protein sources such as algae, leaves, yeast, fungi and bacteria; and d) increase the plant proteins available to humans by eliminating animals from the food cycle. It must be acknowledged that such an emphasis on cereal and oil seed proteins has a practical basis; however, the view of animal agriculture as a contributor to the world's food deficit is based on a failure to appreciate the nature of the feed inputs in livestock production.

Dr. Putnam is Director of Animal Science, U.S. Department of Agriculture, Beltsville, Maryland. Drs. Moore and Bayley are his former associates.

The statement that the conversion of plant protein to meat and milk is only 10 percent to 25 percent efficient assumes that livestock are exclusively grain consuming animals. The assumption is incorrect; farm animals, particularly ruminants, convert feeds other than grains into protein for human consumption. These other feeds consist of forages, by-products from harvesting or processing food crops, by-products from processing animal products, and non-protein nitrogen, none of which are competitive sources of protein for human consumption. They should not be included in this kind of efficiency calculation. Animal forage plants are not generally consumed by humans. In the United States, on the average, 60 and 90 percent of the dietary protein consumed by cattle and sheep respectively is obtained from forages; in poor countries these percentages are even higher. In addition to not being used by humans, forage protein tends to be grown on land unsuitable for producing other crops. Such land, though less productive than crop land, is important as a food source when converted into animal protein because of the immense acreages.

In addition, all classes of livestock make use of feeds which are by-products of the manufacture of flour, starch and other human food items. Some of the more important by-product feeds are wheat mill feeds, corn gluten feed and meal, distillers dried grains and rice mill feeds. These feeds are not suitable for direct human consumption but can be converted into nutritious and palatable milk and meat proteins by livestock. Urea and other non-protein nitrogen sources which humans cannot utilize can also be converted to animal protein by ruminants. Urea, relatively cheap and increasing in supply worldwide, is being used extensively in dairy and beef cattle feeding and to a lesser extent in lamb feeding; if soybean meal were fed in place of the urea now fed annually in the U.S., the requirement for soybean meal for livestock would be increased by nearly 900,000 tons annually. The main restraint on increased urea use is the large amount of feedgrains and oil seeds available and the consequent low competitive price of the grains.

The comments above indicate that, before concluding that livestock compete with humans for proteins from cereals and oil seeds, the proteins that livestock produce from other sources must be considered. For example, data from a survey conducted in Wisconsin involving 1,500 cows in 46 herds showed that the amount of protein fed from cereals and oil seeds in current normal practice averaged 392 pounds per lactation, while milk protein production averaged 377 pounds, so that 96 percent of the protein from cereals and oil seeds was returned as milk protein. Had urea been used according to our present recommendations based on recent investigations at the Beltsville laboratory and elsewhere, the cows would have produced 377 pounds of high quality milk protein from only 274 pounds of cereal grain and oil seed protein. Thus, pro-

tein production for human consumption could be increased nearly 40 percent above input by combining cereals and oil seeds with urea and forages to produce milk.

Beef production from a cow-calf operation may also be calculated on a protein input-output basis. Assuming an 80 percent calf crop and four calves weaned at 400 pounds during the cow's lifetime, a cow and her calves would produce 343 pounds of protein as meat and would require 1,044 pounds of protein from cereals and oil seeds under relatively good U.S. management practice. This 30 percent return in edible protein is inefficient, but it is considerably higher than the 10 percent figure often cited when protein sources non-competitive with human food are included in the ratio. However, these management and performance levels are below our recommended practices: if recommended range, pasture management and breeding practices were combined for greater efficiency, a beef cow should produce seven calves before slaughter, and these calves should be weaned at 500 pounds. With such improvement, and with the use of urea, output per cow increases to 544 pounds of beef protein as against an input of 549 pounds of cereal and oilseed protein—that is, a conversion ratio of 1:1 and an end product of unquestioned nutritive value and palatability. If these cattle were grass fattened, the protein yield would greatly exceed the protein provided from cereals and oil seeds. Furthermore, in the calculations above, no credit is given to crop by-products such as distillers grains or corn gluten which are not used by humans but can be used in beef cattle rations.

Promising research leads. The efficiency with which dairy cattle, beef cattle and sheep utilize non-protein nitrogen in combination with low quality forages can be greatly increased. In experiments conducted in Finland, dairy cows fed a ration of urea, potato starch, cellulose and sucrose have produced in 1 year up to 4,325 kg. of milk and 164 kg. of protein without any feed source of protein. Some reports in the literature have shown that non-protein nitrogen, transformed into protein by bacteria in the cow's stomach, can serve as the sole source of nitrogen in ruminant rations. In experiments conducted at Beltsville, an Angus female weighing 132 kg. was put on a purified diet containing urea and no feed source of protein; she gained at the rate of 0.45 kg. per day to a weight of 422 kg. and produced a calf. In experiments with lambs, an average daily gain of 0.10 kg. was obtained with urea as a sole source of nitrogen. If such a development could be placed into practical use, it would mean that no exogenous source of protein would be required for the production of animal products by ruminants.

Similarly, there is the potential for increased efficiency in the utilization of the complex, fibrous carbohydrates. For example, with mature cereals such as corn and wheat, half of the carbohydrates and

some of the other nutrients produced are not suitable for direct use by humans. Ruminants can utilize these "waste" products; but improvements in utilization are needed, chiefly from chemical treatments to improve the digestibility of forage with high fiber content. We do not mean to imply that the future rations of ruminants will consist only of urea and chemically treated poor quality forages. The basic feeds are likely to continue to be cereals, cereal by-products and good quality forages. However, as competition for food for humans increases with population growth, economics will dictate the extent to which urea and poor quality forages will be used in ruminant rations. To meet this challenge, research information should be obtained now.

In addition to research on the use of non-protein nitrogen and the digestibility of low quality forages, the potential of research on improvements in forage production should not be overlooked. These would include the genetic development of forages for increased production and adaptability, the use of fertilizers, improved cultural and management practices, and the use of insecticides and herbicides. The above is particularly pertinent to developing countries where present practices in utilizing forages for protein production are extremely inadequate. In some countries cattle are on deficient rations during the dry months and have adequate nutrition only during a few months of heavy rainfall. The full potential for increasing the contribution of livestock to world protein supplies includes increased efficiencies resulting from improved reproduction of all types of livestock, greater feeding efficiency, reduced losses from disease and parasites, and improved systems of management and housing. Research directed at all these problems can contribute greatly to the role of animal agriculture in producing world protein.

It is well known that the countries with the higher per capita incomes are, in general, the largest consumers of animal products. There are differences based on past habits; but it is noteworthy that rice-eating Japan, in its postwar affluence, is willing to pay the price for increased animal proteins even when it means importing feedgrains. Thus, most people prefer to eat meat, eggs or milk when they can afford it, and it appears probable that there would be considerable unrest if this choice were to be eliminated by government actions. The nutritive value of animal protein as a supplement to cereal and legume diets is well established.

[Adapted from "Ruminant Livestock: Their Role in the World Protein Deficit," Agricultural Science Review. Washington (D. C.): U. S. Department of Agriculture, Cooperative State Research Service, Vol. 5, No. 2, Second Quarter 1967, pp. 1-8.]

Grassland Improvement

A. T. Semple

[Progressive deterioration of the plant life in grazing lands and of their capacity to support livestock is a worldwide problem. Their improvement requires adoption of sound practices by graziers and farmers, and government efforts to spread information, learn from experience, and develop supplemental feed sources as appropriate.]

In most extensive areas of grazing land with a low carrying capacity, the natural flora produces nowadays much less forage than it did when domestic livestock were first introduced on them. This is widely true in newly settled areas like the U.S., South Africa and Australia where more reliable records are available, and it also appears to be characteristic of the older settled areas in Asia and Africa. Many of the more productive and palatable plant species have been killed out or greatly reduced in vigor as a result of being grazed too closely for many years. Bare soil has led to erosion of the more fertile and friable surface soil, to the formation of gullies, and to lowered watertables; as a result, less water is absorbed into the soil, and the remaining plants cannot make as much growth as under virgin conditions. Such situations, occurring as they often do over large areas of a country, should be a matter of great concern to governments. Stopping this deterioration should be of special interest to those engaged in agricultural education and extension work. Farmers, graziers, and others concerned with the ownership, management and supervision of grasslands can learn from experience. They can get technical training in

Mr. Semple has been a consultant for the Food and Agriculture Organization of the United Nations and the U.S. Department of Agriculture.

schools, and information from agricultural extension workers and experiment stations; they can learn which practices should be used, and to approximately what extent, for grassland maintenance and improvement. They must learn these things and apply them if food supplies from grasslands are to be improved and increased enough to meet growing national and world needs.

Most grasses grow for only 3 to 6 months of the year, principally because during the balance of the time the weather is too cold, too dry, or both. If too many animals are grazed too early in the season, and the grasses are eaten off too closely during the growing-season, the herbage cannot make nearly as much growth as it should. Even in those parts of the tropics where temperature and moisture conditions are always favorable, grasses make much more growth in what corresponds to the temperate zone spring and summer than in the autumn and winter-like months. If the grasses are grazed as rapidly as they grow, their total production is usually reduced and there is obviously insufficient left for the stock to eat during the season of little or no growth. Moreover, the reduction of top growth by grazing also reduces root growth, so that over-grazed plants have insufficient root reserves for starting growth in the next favorable season. These conditions pose a problem for livestock producers because livestock need about the same quantity of feed each day for the 365 days of the year. Therefore, herds should be so managed that only a part of the growth is used at the time it occurrs and the surplus is kept as standing grass, hay, or silage, for use by the stock during the season when the grasses, etc., grow less or not at all.

However, some sod-forming grasses, such as buffalo and blue grama, may produce more when clipped or grazed frequently, than when they are cut only at the end of the growing season. The procumbent habit of the sod-forming grasses tends to keep grazing animals from removing too much of the plants' leaf surface which is needed for photosynthesis. Furthermore, their slow growth in spring keeps their root reserves from being depleted too rapidly. But tall grasses make the greatest growth if they are not cut or grazed before maturity.

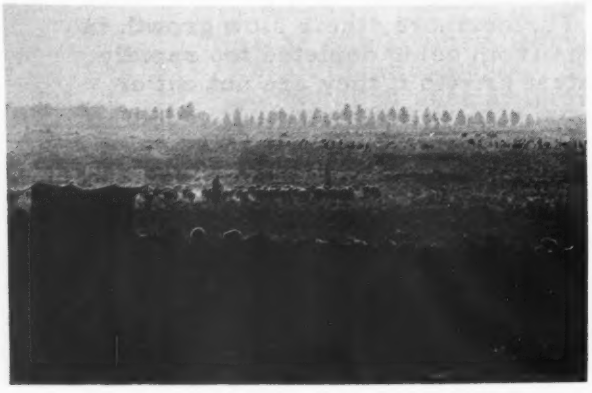
Altogether, good management of natural grassland under arid and semi-arid conditions consists basically of keeping the most desirable plants in a state of vigorous growth year after year. To do this, it is necessary to have about 50 percent of the current year's growth remaining at the end of the growing season. To accomplish this objective, it is necessary to adjust the numbers of livestock that are being kept from year to year, because the production of forage may be as much as 50 percent below the average or above the average in any one year, on account of differences in

rainfall. Consequently, the cow herd or ewe flock should be kept relatively small, so that adjustments may be made in the numbers of young stock that are kept over winter when the forage supply is below average. In cases of severe drought, all yearlings (including all or nearly all of those that are being kept for replacement in the breeding herd), most or all of the calves, and a heavier culling than usual of the aged cows, may have to be sold in order to reduce the stock to the carrying capacity of the available forage. For such emergencies, sufficient reserves of hay, silage, or concentrated feed should, if possible, be kept to carry the breeding herd through at least one winter and preferably through two winters. Even then it may be necessary to graze more heavily than is desirable in one or two years out of ten. Furthermore, in the most severe droughts, nearly all of the good grass and other herbage may die. Then there should be no grazing at all until a vigorous stand is restored, which may take from 1 to 3 years or even longer.

Under some conditions, the productivity of natural grasslands may be increased by cultural practices such as pitting for water conservation, fertilizing, and seeding more productive grasses than the native ones. Eventually, native grasses may crowd out the seeded ones; if this happens, seeding may be repeated if it seems likely to give increased returns that will justify the effort and cost. Optimum vegetative cover should, moreover, be maintained to reduce to a minimum the silting up of reservoirs. Similar measures are necessary to maintain favorable conditions for desirable wildlife and to prevent excessive wind erosion, active dunes, and dust storms, on both private and public lands.

Nomadic Grazing

Unfortunately, nomadic grazing, and particularly nomads, are often looked upon as being undesirable. Yet in many countries with high mountains rising rather abruptly from lowland plains or plateaux, the movement of flocks and herds from the lowlands to the highlands in spring and summer, and from the highlands to the lowlands in autumn and winter, is a well established and honored way of life. The animals and people involved usually have a more complete home in the lowlands, and depend upon less pre-



Nomadic herds in Iran. [Photo: AID]

tentious or even makeshift quarters and shelter in the highlands which they use regularly each year. Most of the nomads in the deserts of northern Africa and southwestern Asia live in tents made of grass, reeds, camel-hair, wool, or mohair, which they carry on camels when they move with their flocks.

In arid areas, where rainfall is inadequate for regular crop production, there is no irrigation and the rainfall fails entirely in some years, natural forage can be used only by a nomadic system of grazing. Animals can be brought to a particular site only when sufficient rain falls on it to enable forage to grow. An area of several square miles may provide merely a few days' feed for several small flocks of sheep during only one season out of three, five, or even ten years. Obviously, sufficient water for drinking must also be available on the surface in temporary pools, or underground in nearby wells, springs, or oases. In the other years, the vegetation may make some growth, but there is too little grass and/or not enough drinking water available to provide for the animals.

The vegetation may have an opportunity of making a fair amount of growth when only light or very localized rain occurs. Thereafter the lack of rain may occasionally be so widespread that it is impossible for animals that have been brought in to leave the area and go elsewhere to feed. Under these conditions, sometimes half or more of the total number of domestic animals in a country or region may die, the pressure of numbers on the available forage being thereby greatly reduced. The grass may then have an opportunity to grow and recover its vigor faster than the reduced number of animals can eat it down. Thus, in an overall manner, Nature tends to maintain such a balance between the livestock and vegetation as she does between the wild fauna and flora. It has been contended that under these conditions of nomadic grazing, there has been relatively little deterioration in large areas of arid grazing land over many centuries, and one may find considerable areas of the least accessible and most drought-stricken range in nearly as good a condition as it would have been if it had never been grazed by domesticated animals.

But this delicate balance may be completely destroyed by digging new wells, putting land under irrigation, locating people in permanent sites, producing and maintaining feed reserves, and thus enabling larger herds and flocks to graze the land every year—to stay on the spot until every bit of vegetation is consumed and then to be there to eat the grass as fast as it puts out new leaves at the very beginning of the next growing season. Such treatment, year after year, is certain to kill practically all the palatable grasses and other forage plants. Consequently, it is extremely important that any program of reducing or eradicating nomadism

be sound in every respect, and that it provide safeguards against overstocking of the remaining grazing land when a part of it is developed for crops. The nomadic peoples must be enabled to maintain themselves though staying in one place throughout the year, or to retain a permanent base to which they can return each year. There is always the danger that such developments may be made during a period of particularly good years when rainfall is above normal, so that when a period of abnormally dry years comes, as it inevitably does, there will not be nearly enough water for the animals and crops, and all or nearly all will perish when the reserves, which have been accumulated during the good years, are exhausted. Under such conditions all good grazing plants, which the animals can obtain within reach of their water supply, will be killed, and the soil will be left with practically no protection or means of recovery within a reasonable time.

In the Algerian steppes, for example, the overdevelopment of underground water for irrigated pastures in an effort to reduce the hazards of nomadic grazing, and the building up of flocks without adequate reserves of natural forage, resulted in the death of seven million sheep in the drought of 1945. Extremely severe overgrazing during this drought resulted in great losses of plant cover and consequent degradation of the soil, marked by increased drifting of sand on cropland. There is now a program for producing and storing reserves of fodder (see below); such programs are bound to fail, however, unless there is an effective way of adjusting the numbers of livestock to the most adverse present and future forage-production situation which may occur.

Integrating the Use of Range and Irrigated Land

In developing sound agricultural, economic and social programs it is extremely important to integrate the use of irrigable land, both for crop production and for pasture, with the use of the arid and semi-arid land fit only for grazing, and also with semi-arid land which is suitable for dry-land crops but for which irrigation water is not available. Usually 40 to 50 percent of the total weight of cultivated crops consists of leaves, stems and other fibrous material which are not suitable for human food but are very good feed for livestock. There are, of course, problems of storage and of sale or exchange when the people owning livestock do not own or control the land which is producing, or is capable of producing, forage crops.

In Iran, for example, large quantities of pulp and molasses, by-products of producing sugar from sugar-beets, were being dumped in the rivers. At the same time and in some of the same localities, as much as 75 percent of some herds of cattle and flocks of sheep were dying of starvation. To correct this great economic loss, dem-

onstrations have been conducted to convince stockmen that their animals would not only survive, but also thrive on such by-products when they are supplemented by cottonseed cake or meal, hay and other products of both irrigated and dry-land farming. To meet this new demand, the sugar factories have since 1963 begun to install equipment for drying the wet pulp, mixing the dry material with the molasses or in some cases with cottonseed meal, and making the mixed material into pellets. These pellets may be stored safely for years in dry climates, can be readily transported to places where feed shortages exist and very conveniently distributed to livestock without any waste. Where drying equipment is not available, the pulp may be made into silage and used along with the molasses and other feeds to maintain and fatten sheep and cattle. In Iran, there is considerable irrigation and dry-land farming, but most of the land is used only for grazing by tribal units in a nomadic system. As irrigated farm production is relatively little affected by the vagaries of weather, irrigated farm products provide a substantial degree of insurance against livestock losses.

The steppe region of northern Algeria has a catastrophic drought about one year in every five. Unless corrective action is taken, this results in such a severe shortage of fodder that sheep numbers are decimated. In good years, there is much more forage than the sheep which have survived the drought can utilize. To correct these conditions, "Rural Livestock Improvement Centers" have been established and the following points have been emphasized:

Fodder crops, the chief of which is alfalfa, have been grown under regular and intermittent irrigation, making use of permanent water supplied by springs, dams and pumps and the flood waters in wadis. The dams vary from those made of brush by shepherds to permanent structures of reinforced concrete. In addition, when the spring rains are abundant, much grass can be cut for hay from the natural meadow lands. Some 40 of the centers have small tractors for such haymaking, and five of them have heavy-duty pick-up balers. Hay stacked in bulk or in bales is the cheapest method of storage in such a dry climate. In addition, there were over 600,000 acres of native vegetation under protection as standing fodder reserves. The great value of these reserves was proved in the southern Oran area in the winter of 1952/53, when about eight inches of snow lay on the ground for more than ten days, and many flocks took refuge in these areas and survived by depending on the tall grass standing above the snow.

In support of the centers, stockmen pay a fixed sum per head of sheep in advance, and are then debited for the amount of fodder which they require from the reserves for their livestock. These

rates are fixed each year by the local societies, which control the operations of the centers. If a stockman does not have cash to pay, he may contribute some of his poorest animals. These are then fattened and sold by the centers to meet the cash requirements. Thus, flocks are culled and numbers reduced to benefit the grazing land.

Control of Grazing

It is practically impossible to care properly for, or to improve, open grazing land that is subject to unrestricted public use. Some arrangement is necessary, whereby one person or an organized group of local people has complete control of the land and its use.

In countries where the animals are always accompanied by herders or shepherds, division of the grazing land among individual users would be relatively easy if all agreed to the advantages of individual rights and were willing to respect them. If the animals are not herded, fencing is necessary. Unfortunately, much open range yields too little to justify the expense of fencing and the development of watering places. It would, obviously, be a mistake to promote the development of new watering places without provisions to ensure the proper use of the land around them. In some countries, land tenure conditions interfere with the application of good grazing practices. There may be a hodge-podge of large and small areas of privately or publicly owned land, most tracts of which cannot be operated separately to advantage. Under such conditions, it may be advantageous for several owners to form a cooperative association and hire herders, build some fences to enclose certain areas or construct drift-fences to guide the grazing animals in their natural movements.

[Excerpted from Grassland Improvement. London: Leonard Hill Books, Plant Science Monographs, 1970, pp. 127-132 and 289-290.]

Integration of the Grain and Livestock Sectors in the Near East

Food and Agriculture Organization
of the United Nations (FAO), Rome

[Cereals and livestock outputs, dominant items in most economies of Near East countries, are lagging behind demand and facing various difficulties. Experience in Australia indicates numerous benefits from an integrated approach to similar problems—improved output in both sectors, a revival and enhancement of soil fertility.]

The integration of the grain and livestock sectors is of crucial importance to the economy of the Near East region for a number of reasons. About 40 percent of the arable area is devoted to the growing of cereals, which contribute about 65 percent of the farm value of crop production. Livestock, besides its contribution to agricultural production (from 14 percent in Afghanistan to 50 percent in Somalia), is a way of life in most of the region. Cereals and livestock constitute, therefore, the main source of income and employment for the agricultural population which includes most of the people in the countries of the region.

In spite of the important role of cereals and livestock in the national economy, they have been a major drain on foreign exchange resources, as the rate of increase of their production has been inadequate to meet the demand arising from population growth and the increase in per capita income. The rate of growth of population averaged around 2.4 percent while cereal output increased by only 2.1 percent between 1952/53 and 1964/65, and livestock production grew very slowly, slightly over 1 percent. The failure of cereal and livestock production to keep pace with the growth in demand is due to a number of factors. In the first place,

there has been a large expansion of dryland farming; cultivation was pushed more and more into marginal areas of lower and uncertain rainfall, with an adverse effect upon average wheat yields and the livestock industry. Secondly, there has been a too wide adherence to a monocultural system of farming. Thirdly, there has been a failure, in many cases, to use efficiently such irrigation water resources as are available, due in part to the antiquity of many irrigation systems which lack adequate storage and do not convey water to the field level nor make satisfactory provision for drainage. Other factors are the failure to use inputs such as fertilizer; lack of adequate institutions and services as well as trained manpower to staff the services which do exist; insufficient research, particularly on the problem of introducing fodder crops into rotations and on closer integration of livestock and crops; problems of custom and land tenure.

The large expansion in dryland farming has pushed livestock more and more into poorer grazing areas. Except for some spasmodic access to residues on cropped areas, they have to subsist on arid and semi-arid rangelands. Increasing mechanization in some countries has reduced fodder supply still further by eliminating stubbles, grazing of which has traditionally provided one of the main sources of roughage for ruminant animals. While reduction in the area of fallows and the elimination of stubbles is probably essential to facilitate more intensive agriculture, livestock are bound to suffer unless fodder crops are introduced into the rotation to compensate for these lost grazings.

It is estimated that some 70 million cattle and buffalo, 110 million sheep and 50 million goats have been competing for survival on a ration that provides little more than maintenance. An understanding of the difference between maintenance and production rations is fundamental to efficient development of the livestock industry. Supplementing the inadequate and unbalanced rangeland rations with high-quality fodder and concentrates, if they can be made available reasonably, could give a very high economic return per unit of input. Considerations should not be confined to cereals. Short-term leguminous rotations can help to balance the livestock feeding rations and also make long-term contributions to cereal yields through improved soil fertility. In the non-arable and semi-arid areas lucerne (or alfalfa) could prove to be the best economic proposition for providing more and better balanced rations for livestock. New irrigation may be necessary; underground water resources should be surveyed and exploited.

Recent Trends in Cereal and Livestock Production

Comparison of production levels in 1966-68 with those in 1961-63 indicates that there has been a pronounced upswing in production of

wheat in Iran, Iraq, Jordan, West Pakistan and the Sudan, and a rise in the rice production of several countries. There has been a decline in production of coarse grains in a number of countries; perceptible increase in production has taken place only in Pakistan, Somalia, the United Arab Republic and Yemen. Further, there appears to be virtual stagnation in livestock production except in the Sudan. There has, however, been a remarkable expansion of poultry production in Lebanon; between 1954-56 and 1967, production of poultry meat increased from 1,600 tons to about 16,000 tons, and that of eggs from about 2,000 tons to approximately 32,000 tons. Lebanon has become an exporter of poultry products.

The introduction of the new high-yielding varieties of wheat and rice in countries of the region in recent years can be expected to make a discernible contribution to cereal output; in fact, in West Pakistan the impact has already been felt. Increased cereal production in turn can have a significance for livestock production through making available larger supplies of livestock feed. However, the introduction of these high-yielding varieties at the farm level is only getting under way in other countries of the region. West Pakistan is emerging as self-sufficient in the major cereal, wheat, and also maize, and may have an exportable surplus. With the continuance of such a trend, attention may need to be given to encouraging more fodder production at the expense of the area under wheat and/or greater utilization of the land for livestock production. The increased production of cereals makes available greater quantities of the by-products for use in the livestock industries. Unfortunately, in the case of certain by-products such as rice bran, which has a low keeping quality, there is already much wastage. In regard to the straw, there will be a reduction due to the introduction of shorter strawed high-yielding varieties. On the other hand, since they are sown more densely and tiller more profusely, what is lost in length of straw might be made up in weight.

There is a need for formulating definite proposals for improved feeding of livestock, utilizing efficiently the byproducts of the buoyant cereal industry. Some form of integration can be achieved by well-considered plans for efficient utilization of the byproducts. Should exportable surpluses emerge, and if marketing difficulties and lower prices prevail, the direct use of the grain itself for intensive feeding of livestock should be considered. There is scope for further development of the poultry industry and for feedlot fattening of cattle and sheep. The relative economies of increased fodder crop production at the expense of grain area will need to be studied carefully.

Advantages of Integrating Cereal and Livestock Farming

Spain, Cyprus and Australia are countries with environmental comparability to those of the Near East region where integration has become basic within the system of farming. Australia probably provides the best example, since two important developments have revolutionized cereal and livestock production there in a few decades.

One of these developments concerns the older established wheat farming areas of medium to fairly low rainfall. The soils, though inherently quite fertile, had over wide areas become badly depleted through the too common practice of wheat-fallow-wheat farming. Sheep were on most properties, but generally on a more or less scavenging basis. There had been widespread degeneration of soil structure, and by the 1920s soil erosion was a menacing national problem necessitating high priority action. Research and widespread demonstration were basic to the widespread recovery which has taken place. Suitable legumes were found and demonstrated, together with appropriate fertilizer use, particularly superphosphate. Leguminous rotations replaced the practice of bare fallowing, and these, together with improved livestock husbandry (in which sheep played the major role) had a very great positive effect on both wheat and livestock industries. Above all, the trend of soil decline was reversed and the future fertility of the soil has been preserved.

The other major development concerned large belts of poor soils in the medium to higher rainfall belt. Efficient scrub-clearing techniques were introduced, followed by the establishment of suitable strains of clover or other legumes together with application of heavy dressings of superphosphate and, where necessary, mineral elements such as copper and zinc. After several years of clover-based pastures carrying livestock, the fertility of the soil has been sufficiently built up to introduce cereals on a rotational basis, with high payoffs.

Largely as a result of these two developments, both the Australian wheat yield and area have increased rapidly. There has been a parallel increase in livestock production. The many benefits of an integrated livestock/cereal industry with rotational legumes, while not strictly quantifiable, are: higher revenue per unit of area; lower unit cost of cereal production; higher net income to farmers; increased productivity of the livestock industry; stimulus to servicing industries and employment; increased government revenues; increased export earnings; and the development and preservation of soil fertility as a long-term asset. These developments could not have been achieved without a group of supporting programs. First, the know-how was established through intensive, continuing research,

and there was adequate provision for its dissemination through an efficient extension service. Adequate credit was made available on reasonable repayment terms and interest rates. Incentives were provided by a subsidy on fertilizer and a guaranteed price to farmers for wheat. Furthermore, long-term contracts on overseas markets were negotiated for beef and lamb. Unfortunately, the institutional barriers to such an array of measures are formidable in most countries in the Near East.

Measures to Improve Cereal and Livestock Output

The only countries in the region where there is much scope for expansion of cultivation under solely rainfed conditions are the Sudan, Afghanistan and Iran. In some cases contraction of area is desirable, if only in the interests of the livestock industry. This should be in the marginal areas where rainfall is inadequate and unreliable for cereal production. On the other hand every effort should be made to expand arable farming where there is scope for efficient production, that is, where among other things rainfall is adequate and sufficiently reliable. In the Sudan, there is abundant scope for clearing acacia scrub or woodland by modern proven large-scale techniques and introducing mechanized farming on relatively fertile soils, based mainly on grain sorghum.

In all areas where rainfall is in excess of 350 millimeters and conditions are otherwise suitable for arable farming, every effort should be made to replace the traditional cereal monoculture and bare fallow with a rotation of cereals and legumes. The collaboration of the extension and research services will be necessary, using demonstrational as well as other techniques of encouragement. The research problem can be simplified by introducing the advanced techniques and successful varieties from other countries. For example, decades of research in temperate, subtropical and tropical zones in Australia have sorted out appropriate species, varieties, fertilizer and the like; naturally local testing will be necessary, but major shortcuts are possible. Generally speaking, fertilizer use in the region is far below the level at which it would be profitable. It goes without saying that the other required inputs should also be provided for.

Every possible encouragement will need to be given to improvement in the livestock industry itself. Disease prevention and the facilities for achieving this are necessary. Measures for overcoming the problem of overgrazing, where it is occurring, are also necessary. The difference between production and maintenance rations needs to be widely publicized and demonstrated in a practical way. Comprehensive surveys of underground water re-

sources should be undertaken with a view to establishing protein-rich fodder under irrigation. Assistance from international agencies for conducting such surveys might well be sought where it is necessary.

The example of the United Arab Republic might well be studied as one of high efficiency in reclamation, levelling and general preparation for irrigation, and in farming development under irrigation. Here there is integration of cropping and the use of fertility-building species using such legumes as berseem clover with livestock husbandry. There is also efficient utilization of the residues of cereal production. The protein element of the feeding rations is, generally speaking, relatively high, and it is obvious that in certain areas more cellulosic and carbohydrate elements in the rations would provide better balance, if they could be made available. Unfortunately, the absoluteness of desert conditions outside the irrigated areas does not offer much scope for rough grazing to supplement the protein-rich fodder being produced under irrigation.

Unhappily, this degree of irrigation efficiency tends to be the exception rather than the rule. Efficient irrigation is evident in Jordan, but in several other countries of the region the level of efficiency is low. In most arid or semi-arid areas where irrigation is being or can be practiced, the dangers of salinization are very real and must be taken care of, both in planning and in farming practice. Bare fallowing in the summer should be regarded as a dangerous practice. Intensive summer and winter cropping should be developed to the full extent of water availability.

While the institutional problems of farm integration of cereal and livestock industries are considerable, much progress can be made in intensive poultry production and also in "intensive feedlot production" of milk and meat, where markets can be developed. The scope for integration of the processing industries and the intensive feeding and fattening industry is large. However, this would call for a substantial increase in production of concentrate feeds. One significant factor inhibiting the expansion of livestock production has been the high price of feed in relation to the price of livestock products. Compared to the developed countries, feedgrain prices in the Near East countries tend to be higher and livestock product prices lower; prices in dollars per kilogram of beef as a ratio to feedgrain prices in 1967, for example, were 13.2 in England and 20.6 in the U.S. compared to about 6.0 in Sudan and Pakistan and around 10.0 in Iraq, Turkey and Syria. Increased feed production is essential, but it has not been possible to induce farmers to grow feedgrains or forage crops on irrigated land as the returns have been less than from alternative crops. Price differentiation as between cereal crops may be a means of encouraging the production of feedgrains.

The importance of marketing, particularly transport and storage facilities, in providing incentives to increasing livestock output must also be stressed. One answer to marketing difficulties might be vertical integration, which could be either forward or backward. Vertical integration has been already developing between businessmen and farmers on a risk-sharing basis in certain countries; this offers advantages of scale and capital to farmers, but there is a danger that farmers may become merely hired laborers. In other cases, butchers have been running completely integrated production and marketing enterprises themselves. There is also need for measures which will provide permanent or reasonably long-term occupancy of land. Land reform alone does not furnish the answer, although in many cases it may be a necessary prelude.

Intraregional Trade: Some Possibilities

The development of grain and livestock markets in reciprocal intraregional trade could be promoted. Exports to other countries of the Near East are already of considerable importance to some countries in grain products, and for Lebanon in poultry products (eggs). About 63 percent of Syrian exports of wheat were destined to the countries of the region, the major markets being Lebanon and Iraq. Some 67 percent of coarse grain exports from Iraq (barley), 69 percent from the Sudan (sorghum), and 32 percent from Syria (barley) were absorbed in the region, the major markets being Saudi Arabia, Lebanon and Jordan. Due to the wider adoption of Mexican varieties Pakistan is already self-sufficient in wheat; Iran and Iraq are also expected to be self-sufficient by 1972. Wheat production has also increased substantially in recent years in the Sudan as a measure of import substitution. Thus, it is the oil-rich countries such as Saudi Arabia, the Gulf States and Libya and, among the others the United Arab Republic, which can provide growing export outlets for the grain surplus countries of the region, but it is essential that prices be competitive.

The expansion of the livestock sector could provide a promising basis for increased exports within the region, given the current trends in grain production. Except in the Sudan and Somalia, it is expected that there will develop a widening gap between potential demand for livestock products and production capacity. For both countries the major markets will continue to be the countries of the region; even though a shortage of meat (especially beef) relative to demand is expected in Europe, it will hardly be possible for the Sudan and Somalia to meet this demand in view of the sophisticated requirements of the European market. Almost the entire exports from the Sudan and Somalia are in the form of live animals, exports in the form of meat being insignificant, although both countries are striving to develop a meat-canning industry for

export. Considering the potential available in the Sudan, the present contribution of livestock to the gross domestic product (about 10 percent) is not commensurate with the livestock population; nor is its contribution to foreign exchange earnings significant. The major requirements for increasing livestock production are the provision of water supplies in the arid and semi-arid areas where the shortage of water limits the use of the rangeland, disease control and improvement of transport facilities. The constraints to livestock development in Somalia are similar to those of the Sudan, principally disease control, feeding problems, improvement of stock and marketing arrangements. Since a major market for livestock products is in the oil-rich countries, the prospect of these countries financing livestock development projects in the Sudan and Somalia, such as establishment of holding grounds, fattening of livestock and chartering of specialized animal carriers, should be explored. Such cooperation would be mutually advantageous; it would raise the present low level of animal protein intake, and it could make a significant contribution to trade expansion and economic growth.

[Excerpted from "Integration of the Grain and Livestock Sectors in the Near East," Monthly Bulletin of Agricultural Economics and Statistics. Rome: FAO, Vol. 20, No. 2, February 1971, pp. 1-8.]

Cooperatives for Iran's Nomadic Herdsmen

U.S. Agency for International Development (AID)

[Nomadic tribesmen who own most of Iran's livestock have been enabled to increase their output and reduce their severe risks by a program which includes cooperative credits and feedlot stations.]

Iran's livestock industry is almost entirely dependent on tribal herds and flocks. While the numerous nomadic and semi-nomadic tribes constitute only one-tenth of Iran's 26 million people, they own 32 million sheep and goats or about 70 percent of the livestock population. Nomadic shepherds of the tribes partially support millions of their settled compatriots. They also give rise to more than $50 million of annual exports in the form of animal by-products.

Iran's nomadic herdsmen have traditionally migrated from the mountainous areas of western Iran during the summer to the coastal areas of the south during the winter in search of grazing land for their livestock. The annual trek of up to 300 miles is hard on the people and even harder on the animals. In addition to cuts in potential income due to migrational weight loss of their livestock, tribal herdsmen lose money by selling them at unfavorable market prices. Animals are usually sold at a sacrifice during drought periods when more than 75 percent of the spring lambs and over 50 percent of the adult animals would otherwise starve. In some years loss of livestock from starvation is as high as five million head. If tribesmen could fatten the livestock themselves and then sell directly to the market, they could make a much better living and consumers would have more and better quality meat. Setting up feedlots on migration routes and near markets would solve many of the herdsmen's

problems, but organization and cooperative action are needed to carry out such improvements.

Qashqai herd stops to graze.
[Photo: AID]

Efforts to develop a modern livestock industry in Iran began in 1935 when the Heydarabad Livestock Station was established as a demonstration farm near Karaj, 35 miles west of Tehran. This and subsequent projects did not effectively reach livestock owners and tribal herdsmen because of a lack of facilities and know-how for coping with the tremendous problems involved, including production of feed, forage and pasture, proper handling of feed, development of selective breeding programs at stations, and training of technicians. More effective efforts for livestock development began in 1950 with the U.S. foreign aid program. AID advisers initiated pilot projects to demonstrate the benefits of improved breeding, feeding and management. However, these programs were aimed at solving the problems of Iran's settled farmers.

In mid-1967, under Bank Omran leadership, cooperatives were organized with assistance from AID in the first coordinated attempt to meet the needs of the tribal people. The Qashqai Cooperative Livestock Feeding Demonstration Project was set up to establish feedlots, provide supplemental feedstuffs and extend subsistence credits to herdsmen of the 150,000-member Qashqai tribe. The project includes a main station located on a 750-acre site in Hosseinabad, near Shiraz, for 2,000 head of sheep and goats and two feed stores.

There are also six sub-stations, each with a 1,000-ton feed store and a feeding pen which has a capacity for 200 sheep and goats. Supplemental feed, a mixture of beet pulp (which was mostly wasted), wheat bran, crushed barley, cottonseed cakes, bone powder, dried alfalfa and beet molasses, costs only three cents per day. The first experiment on 510 sheep showed that they gained an average of 25 pounds on the mixture. When the sheep remained at the feedlot for 90 days, they gained a total of 306,000 rials ($4,100) worth of additional meat.

Qashqai tribesmen have responded enthusiastically to the project and have repaid loans conscientiously. In fact, the project has proved so successful that Bank Omran has increased the Qashqai cooperative credit funds from an initial 30 million rials to 100 million rials ($1.3 million) in 1969. To have an equipped center right next to their range and to have ready access to feed, medicine and technicians has long been beyond the dreams of even the most optimistic herdsmen. Now many of them are wasting no time taking advantage of it.

Prior to 1967 there were no cooperatives among any tribes in Iran. To obtain loans at 12 percent interest from the Agricultural Bank, tribal people were required to have a co-signer for their promissory notes; in most cases the co-signer would charge 50 percent of the loan. The 24 tribal cooperatives organized by Bank Omran early in 1967 loaned the tribesmen 16 million rials ($213,000) that year. All of the 2,600 tribesmen who joined the cooperatives in 1967 repaid their original loans in full in just seven months. Encouraged by these successes, tribal herdsmen are joining in growing numbers. In 1971 this program, originally undertaken by Bank Omran as an experimental pilot project, was recognized as a regular activity and transferred to the Ministry of Housing and Development which has responsibility for tribal affairs.

[Excerpted from "Cooperatives for Iran's Nomadic Herdsmen," War on Hunger: A Report from The Agency for International Development. Washington (D.C.): U.S. AID, Vol. III, No. 6, June 1969, pp. 9-11.]

Effective Planning to Increase Livestock Production in Developing Countries

R. E. McDowell

[The planners of livestock programs should give greater stress to: methods of attaining large initial gains in output; larger, more specialized commercial enterprises rather than small farms; more exacting analysis of the purposes of livestock projects; and serious efforts to work up "profiles" of local physical conditions to guide technology.]

Although numerous countries have given relatively high priority to plans for enhancing their supply of animal products, implementations have lagged. Some of the reasons are due to top priority being given to more rapid means for expanding food production, but others are attributable to previous experiences with the poor returns from livestock programs already supported. In the past, livestockmen have not been cost-return oriented towards steps for improvement, and have earned a bad reputation. Man is more emotionally tied to livestock than to plants, which has resulted in the feeling that innovations in the animal area would be more stubbornly resisted. There is also a growing opinion that food needs can best be met by plants alone. The future, however, looks promising for change in a number of countries: with more of them approaching self sufficiency in foodgrain production, they are beginning to recognize the need for agricultural diversification to provide stability and to save foreign exchange, and there should then be a larger role for livestock.

Dr. McDowell is Professor of Animal Science, New York State College of Agriculture at Cornell University, Ithaca, New York.

Initial increase in output. Livestock planners could benefit from recent experiences with changes in crop production methods in many countries. An initial package of practices was provided which increased production in sufficient magnitude to attract the required initiative and capital investments. In contrast, the usual projections for animal improvement through artificial insemination, and the recommendations for expansion of forage crop production and animal health programs, have generally produced relatively small increases over traditional or existing methods. An increase of 10 to 20 percent over that of common experience for milk yield or cattle growth, for example, can hardly be distinguished from changes in yields resulting from the usual seasonal or annual fluctuations occurring in many areas. Even though the inherent potential for performance of cattle may be increased by crossbreeding enough to enhance their capabilities by two- or three-fold, most of the time this has not materialized because other factors interfered, and later crosses have been more disappointing. Many of the proposed plans have not, therefore, produced the essential motivation for the continued changes necessary in the development process.

If outputs from livestock could be doubled or tripled, like the outputs currently being realized from some crops, this would make the response quite different. However, the cost of the inputs required to obtain such a two- or three-fold increase is usually beyond the reach of most existing livestock enterprises—be it a holding of a few hectares, a tribal group covering large areas of unimproved land, or a "commercial dairy enterprise" which has less than 30 percent of its females of all ages in milk and a beef herd with less than 50 percent of its females over three years of age weaning calves each year. But assuming the initial stage of doubling or tripling outputs could be obtained, then the acceptance of subsequent innovations in the magnitude of 10-20 percent assumes a different character. A 20 percent increase in the weight of a calf weaned at 180 kg., or an increase in milk yield per lactation in a herd averaging 3,000 kg., will buy a lot more inputs and bring about much greater motivation for further efforts on the part of producers than would similar percentage increases over the methods currently employed.

In addition, producers of any commodity must be assured of a price for their products which will allow the use of inputs—labor or otherwise—to at least return profits and, in the case of innovations, to assure that the gains in productivity will bring correspondingly increased incomes. According to some analysts the recent upsurge in rice production in Southeast Asia stemmed both from the package of improved practices and from a rise in prices due to scarcity of foodgrains at home and a decline of surpluses abroad.

A similar occurrence is needed for livestock products; but this price feature is often slighted.

Defining goals. Governments need to clearly separate the goal of real growth—expansion of the output of livestock products—from the goals of social development and political participation. Usually the basis for livestock programs is said to be the need for increased supplies of animal protein for the undernourished and lowest income groups. Yet most programs have failed to achieve this objective, in many cases because they were directed to small producers with limited resources to help a backward sector or area. In the future, planners would be wise to consider carefully whether there should be programs especially oriented toward increasing animal products from small rural holdings. Evidence suggests it is highly questionable if this is desirable from the standpoint of investments and the support required—the necessary extension services, credit, etc. — or even for social reasons. The head of a household in a low income group will sell practically all his livestock products for needs of capital or to buy more food. A household in a rural village can ill afford to slaughter a pig or a cow for home use; therefore, these are sold routinely to higher income urban markets. Except on religious or festive occasions, the major animal products used in rural areas are eggs and milk, both of which have wide seasonal fluctuations in supplies and competition from alternative choices.

There are limitations on the quantities, as well as inconsistency, in the supplies to be expected from small farms, and there are restrictions on the availability of capital to them for expansion. When governments consider the main purpose of their livestock programs to be enhancing total food production for human consumption, they should therefore provide economic incentives to a different segment of the population. Emphasis should be towards promotion of commercial and semi-specialized or specialized enterprises. This will require much greater flexibility in the approach toward modernization—be it feed supplies, disease control methods, the type of animals used or the management practices employed. Furthermore, the promotion of commercial enterprises may be followed either through: 1) the development of the individual enterprise in progressive stages of expansion and change, or 2) enterprise development in a single stage. The former may be appropriate to a grading-up scheme for cattle or sheep, in which improved husbandry and increasing amounts and numbers of inputs must be closely associated with the grading process, so that planning must be on a continuing basis. In the latter, complete new units will be established or older ones modernized in one step, as has almost universally been the case in poultry and swine enterprises and has occurred to a lesser extent in dairying.

Government support. Some degree of governmental assistance is normally required for livestock programs, either in the form of direct subsidy to producers or indirectly through support of services, education, training or marketing. Any proposal ought to include the degree of support required, along with projections on whether the program will eventually be self sustaining—except perhaps for certain services. If a program anticipates expansion on a free market basis, then it should include provisions for government assistance through extension services, guaranteed loans, aid in developing marketing facilities and perhaps support for farm record keeping and artificial insemination. To establish and maintain an export market, direct subsidy for assembling, feeding out animals, and processing products may also be required. Similarly, projects directed solely toward increasing domestic supplies of animal products will normally require heavy subsidy, either direct or indirect. Direct subsidies may go to the producer—as in Puerto Rico, where each producer has a quota and receives about nine cents as subsidy payment for every quart of milk delivered to a milk plant, out of a total of about 19 cents. Puerto Rico also pays a direct subsidy for each calf kept beyond three weeks of age. Another type may be channeled through the milk processors, as is done in the U.S. for butter and dry milk solids. Indirect subsidies can be given through such activities as supporting feed mills, livestock markets or processing plants. Assistance may also be supplied through a protected market where tariffs or preferential treatment are provided to certain segments of the industry, such as restrictions against imported animals.

Direct support may also come from setting up and operating installations where the costs are largely provided by the government. The purchase of land, erection of buildings for both animals and milk processing, and the supplying of technical management by the government of India to establish the milk colonies near most of the large cities is an example. In other countries, governments have established and supported the operational costs of large farms for providing improved stock for general distribution. If the objective is to promote development through establishing or assisting cooperatives, support from public resources is usually required in the form of extension services, guaranteed loans, veterinary services and capital investments in equipment or buildings.

Purposes the livestock are to serve. The following classification of the reasons for keeping livestock will help in specifying the segments of husbandry that should be assisted. 1) Livestock are kept to supply markets with products for which there is a demand based on special cultural habits. In some societies this entails the purchase of a pig smaller than the size for most efficient production, or of live poultry which requires extra handling before being consumed. 2) Edible livestock products are by-products

from animals kept mainly for agricultural power. 3) Livestock are kept to provide some returns from lands inaccessible to markets. These lands are currently unprofitable for agricultural production other than that which may be realized through cattle or sheep production. 4) Livestock serves as a "bank," or a means of providing a reserve: for food in period of shortage, a reserve which may be sold to meet emergency needs such as death or crop failure, or used as a feature of celebration. 5) Livestock are kept to enhance total food supplies by making more complete use of land and by-products that would otherwise not contribute.

In (1) the market tends to be restricted because the cost of product is outside the routine household budget; while (2) and (4) presently contribute relatively small fractions of the total animal products, and will continue to do so with the advances of mechanization and shifting of agriculture. There is serious doubt about investments in programs for these three sectors, since there are few changes which can make for very profitable enterprises. Also, supplies from these sources may be quite seasonal. Category (3) is, in the long run, a transitional stage; current enterprises will probably either be replaced eventually by other forms of agriculture, or become more intensive livestock operations with improvements in transportation. Thus, in order to increase the total output of livestock products the major emphasis for developmental support should be toward category (5). This encompasses at least three major groupings: a) cattle or other species kept near urban centers to utilize the by-products of industry and food processing; b) animal production as a useful phase in the crop rotation cycle, and for the utilization of rougher lands on larger farms; c) an integration of small holdings or farms to act as suppliers to large units for fattening or milking. Category (5) will generally entail fairly high investment costs per farm and rather sophisticated management techniques.

Planning for inputs. If animal products are to come from commercial enterprises, efficient functioning becomes similar to any other business. Inputs are of two types, those which give immediate returns for land and animals and those associated with long-range development. Examples of the former would be the application of fertilizer, weed control and rotational grazing for land, and for animals adequate water supplies, close attention to females at parturition, flushing of females before breeding, measures to control diseases and some use of shelters. Long-range inputs for land would be such things as seeding of perennial crops and the development of irrigation. Some for animals would be adjustments of the breeding season to coincide more appropriately with the availability of feed, use of selected sires, some stores of feed to prevent serious seasonal fluctuations, more extensive use of shelters and vaccinations for controlling certain diseases. Most all of these require fairly large capital investments, either direct or in equipment and facilities.

Investments are of various sizes. Capital requirements for intensification of management and labor are relatively small: examples would be close attention to females at the time of parturition, an extra crop of feed per year, and a limited amount of stored feed supplies. Some of these can be accomplished by individuals no matter what the level of enterprise. Larger capital outlay is required for insemination services, importation of stock, land tilling, seeding, irrigation, harvesting equipment, and heavy applications of fertilizer. In determining the classifications of animal production methods, the likely speed of return and the capital requirements should be given careful attention.

Cultural inhibitors. There exist almost everywhere, and particularly in rural societies, cultural practices which can inhibit maximum efficiency from livestock. Sentiments against slaughter of cattle in India, for example, are fully appreciated as being deterrents; but probably a more important inhibitor in this case is the lack of cheap fuel to replace animal dung as the fuel supply for households or as a cash income for many families. The preference for freshly slaughtered meat has defeated more than one attempt to expand and improve the efficiency of meat supplies. Failure to recognize the value placed by certain societies on cattle as a measure of wealth; community attitudes toward proper regulation of the use of communal grazing lands; the customary uses or methods of preserving animal products; the preference for milk with a high fat content and for meat from animals of a certain size or weight; pride in family ownership; and a close attachment of animals to the household—all these aspects seem to have generally been approached on the basis that such inhibitors to change would disappear when certain economic incentives are offered to (theoretically) enhance animal production. Unfortunately, this does not happen; more often than not, these ingrained attitudes remain a major obstacle to programs achieving much of their objectives.

Characterizing the environment. Due to inadequate research in the local environments, recommended applications of technology have been on a speculative basis, and for numerous reasons such an approach will continue. However, knowledge has progressed to the point that if a reasonable facisimile of a "profile" of the physical environment the animals will be subjected to is prepared, a great deal can be projected about the application of certain aspects of technology. Profile as used here refers to the elements which man usually has little or no control over—i.e., rainfall distribution, soil fertility and pH, photoperiod and some disease problems; or can control to a degree—i.e., the impact of disease and parasites and feed supplies. If local conditions can be described relative to extremes of temperature and their duration, the level of humidity, the distribution of rainfall and the soil con-

ditions, a great deal can be determined about the direct effects the local conditions will likely have on the animals, the seriousness of parasite problems as well as limitations of feed supplies in terms of quantity and quality. Where data are inadequate, on-the-spot surveys of the types of animals, the use being made of them, the degree of fatness and the quality of the crops, could be quite useful in identifying some of the fluctuations in various environmental factors. Interviews with local residents regarding animal diseases and parasites, age of livestock when marketed and cropping patterns, identifying grasses native to the area and the approximate crop yields will aid in extrapolating information from other areas that have been more extensively characterized.

Development of a profile as complete as possible has the value of avoiding duplication of research, and it can prevent costly mistakes in a program—particularly if there is reasonable evidence beforehand that the anticipated approaches would not likely yield beneficial returns, or that the use of a certain species of livestock would not be warranted on an economic basis. It has been demonstrated time and again that the most rapid and significant changes which can be made in the production of livestock products are through practices which ameliorate the major impacts of the physical environment; hence, there is a very strong case for spending time and effort to characterize local environments as a preliminary step to both planning and application. It is clear that programs to expand food supplies from livestock are warranted in most of the developing countries, but that support for those on-going as well as those projected are not as extensive as they could or ought to be. The prospect for higher priorities to livestock can be changed if those involved in the planning and implementation do a better job in assuring that there is reasonable certainty in the technical and economical soundness of proposed new production methods.

[Excerpted from Effective Planning For Expanding Livestock Production in Developing Countries. Ithaca (N.Y.): New York State College of Agriculture and Life Sciences at Cornell University, Cornell International Agricultural Development Mimeograph 32, November 1969, pp. 1-11.]

EXPORT DEVELOPMENT I

FREIGHTER BEING LOADED IN THE PORT OF SINGAPORE
[PHOTO: UNITED NATIONS]

Export Development — Basic Principles and Methods

Amicus Most

[This article is an introduction and summary of a two-part treatment of exports. Export Development I, in this issue of the Development Digest, covers exchange rate and trade policy, export financing, and export incentives. Export Development II, to be in the July, 1972 issue, will contain articles on product selection, export promotion and markets in industrial countries. (NOTE: see also Exports section in Development Digest of July 1969, pp. 3-42.)]

There has been a mounting appreciation in almost every developing country of the need for increasing and diversifying exports. There have been many success stories and many failures in the efforts at trade development; numerous methods were tried, some were discarded and some successful. We will attempt here to summarize some results of this experience. It is only in recent years that most developing countries have begun to think in terms of a national strategy, with systematic plans and consciously selected methods for developing the processes necessary to increase trade. Taiwan, South Korea, Hong Kong, Singapore, Mexico, Israel are examples of successes based on overall planning developed some years ago, and we believe this approach should be more widely adopted.

It is clear that overall economic growth rates are affected by export growth, as Table 1 illustrates. It has also become clear that, in terms of quantities of foreign exchange supplied, foreign trade is more important than aid to developing countries; also, trade

Mr. Most is Director, Export Development Assistance, Agency for International Development (AID), Washington, D. C.

Table 1: Increase in Gross National Product and Exports: 43 Less Developed Countries, 1960-69

(annual growth rates in percentages)

GNP Growth Rate	Number of Countries	Mean GNP Growth Rate	Mean Export Growth Rate
0 - 4.0	10	3.2	3.5
4.1 - 6.0	19	5.1	6.9
More than 6.0	14	9.6	17.8

SOURCE: AID

receipts are usually available for use without conditions or restrictions. A central feature of development is an increase in imports; foreign exchange earnings are needed to pay for important inputs of technical know-how and for investments in modern equipment and machinery. Economic growth often requires large inputs of imported raw materials or consumer goods as well. Almost every developing country is, therefore, seeking sources of foreign exchange, and those with balance of payments deficits are under special pressure to do so.

More and more countries are engaged in organized but not always well-planned export activities. Export organizations, private and public, have been widely established; incentive measures of various kinds have been adopted, financing plans created, and market research-promotion efforts developed. In these and other ways growing interest is demonstrated. New international organizations have been created to assist in this effort. In the United Nations family, the International Trade Center (ITC) in Geneva and the UN Industrial Development Organization (UNIDO) are actively promoting export programs. The Organization of American States (OAS) has established the Inter-American Export Promotion Center (CIPE) as its export development arm. New training schools and programs are being developed. Bilateral assistance is being given to these programs by a number of developed countries, including Sweden, Canada, Great Britain and U.S.A. AID has recently established an Export Development Assistance office in Washington to assist in programs throughout the world, and such assistance has been extended in Korea, Central America and elsewhere.

A program of export development is of course conditioned by the history, economics, geography, climate, natural resources, traditions and the political factors in each country. Nevertheless, certain general patterns may be applicable in whole or in part to others. It seems increasingly evident that the major export success stories

have not been accidents, but are the result of planned government programs, and that a set of principles and methods can be described that will provide guidelines for other countries. In simplified terms, any program should contain the following basic elements:

a) Desire to Export. A national sense of the necessity for export development and a willingness to do something about it are basic requirements, and can be stimulated if desirable.

b) Entrepreneurial Community. There must be an entrepreneurial and trading community interested in and capable of developing and marketing the necessary manufacturing and agricultural output. If such a community is weak, there should be evidence that it can be strengthened, or if it is non-existent that it can be created. Positive steps should be taken to develop such a community where necessary.

c) Organization. An organizational structure is needed that can mobilize and activate all the related sectors, including the economic ministries, government and quasi-public support institutions, banks, and educational institutions, along with the trading and producing community, private and public.

d) Economic Studies. Initial studies must be made of the economic conditions and requirements for a program; these should include a prognosis of the potential export growth rate and the establishment of priorities to channel the resources needed to create this growth rate.

e) Export Financing. Short term working capital, and longer term investments for export-oriented production, are necessary. Government programs to expand loan capability and provide capital to exporters on concessional terms are usually needed.

f) Incentives. A broad program of economic incentive measures, and a removal of disincentives, will motivate the private and producing sector to engage in export trade. These should include comprehensive measures for the removal or remission of inhibiting taxes and procedural barriers, the creation of credit and export insurance support, and the development or strengthening of promotional and support institutions.

g) Product Selection. Based on defined criteria and the nation's comparative advantages, products should be selected that are already exportable or can be made exportable and that can meet the competitive requirements in the available international markets.

h) Export Promotion. International export promotion programs and organizations are necessary for what may be broadly defined as the "selling" process.

i) Support Institutions are private and public organizations and facilities that assist the production and trading community. They might include, but are not limited to, such activities as technical assistance, quality control and inspection, productivity aids, product standardization, market research and promotion, export insurance, transportation facilities, testing and product development laboratories, dispute arbitration, etc.

j) Training. Training of personnel at all levels will be required to carry out the program.

Implementing the Elements of a Program

In developing exports it is important to have a complete national strategy and program. Bits and pieces of a program, which in themselves can be productive, may be useless or inadequate when they are treated as the major effort. Because this kind of activity has been spreading so fast, some of the directors of export programs may lack training or understanding of some elements of their program. They may, therefore, select the more obvious and known concepts rather than try to develop a complete strategy. They frequently look to the developed countries for advice and guidance, but unfortunately these advisors in many cases reflect the conditions in their own countries. The U.S. and European countries do not have "a development problem;" in their approach to exports, they are engaged less in working out new products for foreign markets than in promoting the sales of products they already have. The developing countries have to create the products before they can be sold. Yet, too often they emphasize promotional activities, even when these activities are premature or only a small part of the total program they should be undertaking. While it is important to work out a complete export program, however, one cannot always wait for its logical, step-by-step development. If an individual product meets international standards and a market is found, it should be pushed without waiting for the whole program. Success stories are important, and one should take advantage of opportunities as they present themselves. Thus, the strategies must be both comprehensive and well thought out, and also flexible and adaptable to local situations that may appear.

Below is a discussion of each of the program elements listed above, some of which are treated more fully in subsequent articles.

Desire to export. Pressure to export may be created by economic necessity—an unfavorable balance of payments, a decline in world prices for a commodity such as coffee or sugar—or by a strong developmental requirement for foreign exchange that impels policy makers to recognize the necessity for large-scale increases in exports. The desire to export does not automatically create the steps

needed to carry out a program or knowledge of how a program should be developed. But it remains an essential ingredient. If the desire, specific or vague, is present and it has a sound economic base, then it is possible to create the requisite "export atmosphere." In order to build up this desire in countries where exporting of non-traditional products is relatively unfamiliar, a certain amount of education of the public and influential leaders and groups will be justified and indeed necessary so that they themselves will create and implement a strategy and program. For example, it may be useful in some countries to initiate an "export drive," to have the president or prime minister and other leading personalities make inspirational speeches to selected groups and localities, and to organize systematic publicity to follow. But it will not be sufficient to "wave the flag" and appeal to patriotic endeavor unless the other elements in the program are undertaken.

Entrepreneurial community. The core group of potential exporters often consists of those businessmen who are already traders. This group can also include those now engaged in manufacturing for domestic use, or indeed any persons who have the ability and imagination to engage in new and expanding activities. In Central America, for example, the trading community in non-traditional products is typically engaged in importing because there has been very little export of such products, and these importers with considerable experience in international trade may be the natural candidates for export activity. Honduras recently curtailed its imports, and facing a loss of income the local importers of non-traditional products—represented by the Chamber of Commerce—became very interested in the possibility of becoming exporters; they are taking specific steps in that direction. In other situations, it may be other groups. Governments can do much to stimulate and guide the development of their entrepreneurial communities, not only by the control of entry into exporting or other activities through licensing, but also through influence on the availability of finance and its terms and conditions, through allocation of import licenses and other permits, through training facilities, etc. Governments should try to encourage a wide spectrum of potential entrepreneurs, including the existing large international trading companies, to embark on the untried overseas expansion the country needs, rather than limit the privileges to the established interests.

Organization. A massive export development program affects almost every part of the economy. A method must be found that will involve every economic ministry and quasi-government agency, the universities, the financial community, and all pertinent elements of the industrial and agricultural business community, and that can bring them together—preferably into a single organization that can plan, coordinate, activate and direct the entire program. In many

countries, the writer has observed the establishment of a top-level export committee composed almost exclusively of government and/or banking officials. These committees may achieve some limited successes, but they will face difficulties and frustrations because they do not actively enlist the private business community in the decision making. In other cases there is a tendency to form a small bureaucratic agency within the Ministry of Economics or Industry, or as part of a financial institution, which is outside the mainstream of economic life. Even when the membership of an export development committee includes the important officials of both public and private organizations, it does not necessarily serve its intended purpose. What is essential is a conscious and continuing effort to get their active participation and mutual support in the tasks that must be done.

In each country or area the form of an export commission will be influenced by local political and economic forces. Ideally such a commission should be independent, though it might be under the general supervision of one of the ministries or banks. It should serve primarily in an advisory rather than executive capacity, but contain within its membership the leading elements of the private and public decision making establishment. It should be assisted by a small permanent staff which will maintain a flow of communication among the commission's members and sub-committees, keep its records, and transmit its decisions to government and financial institutions for implementation. Cross section sub-committees, involving in each instance the private and public organizations and individuals involved in a specific problem or product area, could be established. Within the appropriate government ministries, commodity chiefs might be appointed, each of whom will work with a related private industry or agricultural group.

Whatever detailed form of organization is used, the objective should be to create an export "atmosphere" and a dynamic approach. One way to reach this goal is to try to involve as many as possible of the export community in the day-to-day decision processes and activities, a method which requires a high level of cooperative spirit that is often very difficult to achieve and maintain. Antagonisms between the private and public sectors, and bureaucratic rivalries and desires to keep all activities under their control, all tend to frustrate the widely inclusive type of organization. Nevertheless, it is this writer's belief—reinforced by the successful experience in Korea (see Development Digest, July 1969, pp. 3-10)—that this approach is feasible, and that in the long run it can bring about a more enduring result than would a more narrowly based or exclusively governmental form of organization.

Economic studies. A program could be launched without any prior economic studies, but it would be difficult to proceed very far. An

initial study should primarily determine realistic levels of export increase and the resources necessary to achieve these growth rates. Export development requires medium- and long-term capital going into many industrial, agricultural and extractive activities; short term credit financing is also needed, and financing is necessary to develop physical and institutional infrastructure. Besides considering the sources of the financial resources needed to achieve growth targets, the study should also concern itself with monetary stabilization and how this affects potential exports. Priorities should be established, and a determination of how far it may be necessary to draw resources from other programs. In conjunction with the fiscal and monetary policies to emerge from such a study, related policies governing trade controls and exchange rates (see discussion in next article) must be recognized as very important in the success of any export program.

Such an initial economic study cannot be very definitive, since it must be based on results of an incentive program yet to be tried and estimates of which products can be exported. However, exact figures are not necessary; trends and educated guesswork are sufficient for this purpose. The main point is that an export program cannot be developed in a vacuum, or separated from other aspects of economic planning, so goals and targets are required—even though they will be changed as the program develops.

Export financing. In an all-inclusive program for export expansion, short term financing must be made available quickly and at internationally competitive interest rates. If new products and new companies and traders are to be encouraged, special measures of attractive financing must be made available. It is not sufficient that this financing be part of a general credit structure. In addition to being made available it should be spelled out and handled in such a way that the export community can understand what kinds of loans can be had and where this credit is available. Traders (who may also be producers), need short term credit as a major tool in their operations. Quick borrowing against foreign orders, letters of credit, inventories, bills of lading, and other export paper, must be easily available. In order to generate this credit where sales are made on a credit basis (which is particularly prevalent in consumer goods exports), export insurance—while not essential—can be very helpful.

In Korea for example, where general interest rates for business loans ranged between 16 percent and 28 percent in 1965, the Bank of Korea made it possible to give short term credit to exporters against letters of credit at 6-1/2 percent interest. In order to make certain that this would not become an incentive to delay deliveries, regulations required a jump to 20 percent if delivery

was not made on the contracted delivery date. This is one example of the many methods of providing incentives to desired actions through terms of finance.

In addition to short term credit, pre-export working capital is essential in order to develop the agricultural crops and manufactured inventories in advance of sales. In the long range capital investments, the type of financing pertinent to exports does not necessarily differ from other development financing. However, priorities can be given in development financing based on specific new export industry and commitments to engage in this business. It is also possible through financing measures to make it unprofitable not to export. A company, for example, desiring to expand its plant might be given financing with a firm commitment to export all or part of its new production for a given period, even if this has to be done at a loss in the initial stages, provided that there is a real possibility for future exports without loss.

Incentives. Every successful export program has as one of its major elements a set of incentive measures that will motivate the potential export community to look upon this activity as more desirable than other activities in which they are engaged. For a description and discussion of the types of incentive measure used throughout the world see pp. 114-128 below. "Incentives" here include both positive measures and the removal of disincentives or barriers that inhibit exporting. Incentives may include tax and other financial measures, and the establishment of support institutions. They would also include removal of such barriers as unnecessary procedures, difficulties in obtaining credit, lack of marketing knowledge, etc. The writer's philosophy concerning the nature of incentives may be stated as follows:

a) While all incentives are a form of subsidy, these should not become merely gifts for particular producers; they should be generalized, designed to create efficiency, and easy to remove when their need disappears. Where protectionist measures or subsidies create inefficient industries, as often happens, they impose a drain on the rest of the economy to support the protected export sector. Some input of resources is necessary for incentives, but methods can be found to minimize the drain on the national budget.

b) As much as possible incentive benefits should be limited to the increased sales of items now being exported or to new exports of non-traditional products. The purpose is to expand exports, i.e., to stimulate exports that would not otherwise occur, not to create an extra bonus for already existing exports. A second reason why tax incentives or removal of tax disincentives should be limited to new or expanded exports is that these do not reduce existing government

resources. Subsidies or tax rebates related to established export products clearly sacrifice existing budget revenues; but where a new export is stimulated, what is lost to the budget is only a possible new revenue, one that might not have appeared without the stimulus. Indeed, if new export activities generate new incomes, hence new tax revenues of other kinds, the incentive scheme may be self-financing on balance.

c) Tariff protection should be limited as far as possible. Import substitution is in theory a proper way to reduce the foreign exchange requirement; however, it often results in high cost industries that attract funds away from export activities to products for domestic use, and act as a brake on export expansion. Tariffs also become politically difficult to remove.

d) A wide variety of incentives should be developed which are applicable to many siutations. They should be constantly reviewed, and changed as required.

Product selection. One of the first steps in any program should be to make a detailed product analysis of a country's exportable items that have competitive advantages in the world's markets. Product identification requires a high degree of expert knowledge. Most people engaged in directing export development are generalists. Production for export is related to the possible markets for very specific products; general market information is useful, but does not give sufficient information to the producer of a particular product. A manufacturer needs to know not only that there is a market for his type of product in a particular country, but also that his specific product meets the market requirements in price, terms of sale, delivery time, quality, quantity, design and packaging. Too often product lists are developed by production people with little knowledge of the market, or by market people with little knowledge of local production facilities and capacities. There is no use producing for an overseas market that does not exist; yet it happens again and again. Product development must be accompanied by specific market research; and because of the specialized knowledge required this research must be selective.

Since it is generally impossible to exploit all possibilities, it is necessary to establish a list of priorities and a set of criteria for selecting products, for both short range and long range development. For the short run, items already being produced should be examined. In most developing countries the selection criteria would include the following: a) high labor content, b) products for which labor could be trained quickly, c) utilization of any existing idle capacity, d) small investments, e) utilization of native raw materials, f) availability of international markets.

There is a widespread misconception that low priced consumer articles represent the best possibility for export development from less developed countries. While there are some possibilities in the initial stages, this is a poor area for competitive growth. Cheap items are often produced in developed countries with highly sophisticated automatic, big-scale machinery, so that their labor content is small and the comparative advantage of low cost labor is lost.

There is a strong belief that, because of the inferior quality of goods produced in the less developed countries, other less developed countries are a prime market for these products. This is undoubtedly true where "free trade" common markets exist, and the establishment or liberalization of a common market arrangement can result in large increases in trade among the countries involved in these pacts. The Central American Common Market, even with its many problems, is the outstanding example. Other regional market arrangements now being developed, such as the Andean Pact and LAFTA in Latin America and comparable groupings in Africa and Asia, could eventually bring similar results and should be encouraged. Where no such arrangements exist there are traditional markets, particularly for familiar products in neighboring countries, and these will no doubt expand and diversify with the progress of development and rising incomes. Nevertheless, the largest and fastest growing LDC markets appear to be, for the immediate future at least, in the industrial countries. Table 2 indicates the recent overall trends. LDC exports to the developed countries are about four times as large as those to other LDCs; and since the former had an annual growth rate from 1966 to 1969 slightly higher than the latter, even when petroleum is excluded, the absolute growth in exports to developed country markets was also about four times as great. This difference in growth values can largely be explained by three factors: 1) the considerable potential import demand resulting from the higher income levels and larger absolute growth of incomes in the developed countries; 2) the high level of tariff protection that the LDCs have generally erected, particularly for products which other LDCs produce; and 3) the trade structures (finance, shipping, insurance, etc.) which have traditionally directed LDC trade toward the developed countries to the detriment of intra-LDC trade.

Product development, while basically guided by economic criteria, must be flexible and dynamic. In determining the list of product priorities and product selection allowance must be made for opportunities of convenience and accidental or unusual growth possibilities. If a market for a specific item develops it should not be held up because it does not fit the established criteria or growth pattern. For example, Korea has developed a substantial market for plywood; in 1969 she exported $81 million, mostly to the U.S. Korea has had no

Table 2: Exports of Developing Countries

(in billions of $)

	1966	1967	1968	1969	Annual Growth Rates
Exports to Developed Countries					
Total	28.08	29.38	32.48	36.15	8.8%
Fuels	-9.00	-10.08	-11.58	-12.34	--
Total excl. fuels	19.08	19.30	20.90	23.81	7.5%
Exports to Other LDCs					
Total	7.97	8.13	8.82	9.84	7.3%
Fuels	-2.77	-2.94	-3.15	-3.41	--
Total excl. Fuels	5.20	5.19	5.67	6.43	7.3%

SOURCE: UN Statistical Yearbook for 1970, pp. 72-73.

timber growth for many years; it is far removed from both sources of supply and markets; plywood manufacturing is a capital-intensive industry, and its quality demands training of skillful engineers and labor. By any normal economic criteria this would not have been selected as a product to develop for exporting; nevertheless, for almost accidental reasons, it has been a major success.

Export promotion. Although some countries overemphasize export promotion before they have products available for export, this does not mean that such activities are unimportant. Export promotion and selling are an essential part of any export program. Promotion requires a professional staff; it cannot be left to amateurs or political appointees with little or no training or experience. Unfortunately, commercial attaches are often in the latter category. In addition, export promotion is an expensive activity and may bring no immediate income return.

It is important to distinguish between the job of promotion agencies and that of the sales organization of a private company or state enterprise. While there may be some overlapping, it is generally unwise for a promotion agency to be directly involved in sales activities. A sales agency will understandably wish to promote profitable items and will, therefore, concentrate on the best items already being marketed. A promotion agency, on the other hand, will attempt to develop markets for new items and to make the wide contacts with the market, will undertake general promotion activities, and will do a considerable amount of market research. Its initial task will be that of market research. It will be engaged in broad

market studies, but more important, it will place great emphasis on determining and reporting the requirements of the market place for the specific items being produced in the home country. This activity will simultaneously develop market contacts which can result in actual sales.

A country embarking on an export development program must determine which markets can bring the best immediate results. It must establish representation in these markets and supply adequate staff, facilities, and budgets to make these services productive and useful. It is often wiser to have a limited number of overseas offices adequately financed and staffed, rather than a great many, none of which have sufficient assets to fulfill their tasks. Since most developing countries can only afford small staffs overseas the staff must be "jacks-of-all-trades." They must understand market structure, public relations, advertising, how to and how not to entertain, what kind of samples and displays are required, etc. They will be furnishing the home office and home producers with detailed information on products, will often be required to settle disputes, and must educate home office and producers to the methods and ideas of business practices in the market countries. While it is very desirable to employ in each of these offices a native of the market country, cost factors often prevent this. This poses an added burden to the knowledge and skills of the staff. Since maintaining offices is expensive, the staff must be few in numbers but for this reason they must have sufficient funds to do considerable traveling in the host country.

The field offices require a home office to back them up and transmit the information to and from the local producers. They also have to supply general information to both the government agencies and the private sector, and advise on government measures required to assist the export process. When potential buyers visit their country the domestic offices must be prepared to help these buyers to locate the products and supply the information required. They should maintain a display center of products available in that country. They may wish to publish a news bulletin or magazine for overseas and home consumption.

There is always a great pressure to enter all types of national and international fairs. While certain fairs may have political or cultural importance to a country, they do not always assist in trade development. Fairs have to be carefully selected, and exhibits should be based on products available for sale, costs, and impact on the market. Similarly, the idea of sending out missions to promote a country's products has great glamor and appeal, but must be treated with caution. One of the reasons for the Japanese success, to be sure, was that thousands of its people went out as individuals and in groups to study markets, production methods, etc., throughout the world. Bringing missions to the home country is equally im-

portant. But we must caution against costly "boondoggle" missions which have no specific relationship to the general program or the specific products and problems of the home country.

One of the useful tools in export development is an exporter's "service" agency in the home country for individual businessmen who are or wish to be involved in exporting activities. It gives them necessary information, helps solve their problems, makes contact with the government or financial institution on their behalf, and generally acts to smooth the way for a businessman—giving him a sense of personal relationship with the government and banks. This is especially valuable for small or new industries. While this type of work goes beyond promotional activities, it well might be part of the task of the home office of a promotion agency.

There are various ways of financing export promotion. Most countries give direct governmental budgetary support to this activity. In other instances this support comes from the Central Bank, or from some combination of business organizations, banks and government. Small fees can be charged for some services such as subscriptions to news letters, advertising, payment for displays, etc; but such fees will not cover all the costs of the organization. Some countries support this activity through direct taxes on exports and imports. For example, Hong Kong charges 1/2 percent taxes on exports and 1/2 percent on imports for a promotional fund. Colombia charges 1-1/2 percent on all imports, and finds this revenue sufficient not only for promotional purposes, but also to finance all types of export activities including direct financing and loans for export development. An arbitrary figure, of say 1 percent of proposed export targets, might be established as a basis for the cost of promotion—a small cost if the services bring results.

This short statement cannot give all the details of an adequate export promotion organization. Studies of activities in this field by Japan (JETRO), Korea (KOTRA), Israel (ATID), Ireland, Mexico, Colombia, are recommended.

Support institutions. Many of the backup institutions required for an export program are expensive to create and operate. Certain activities such as product development, quality control, quality inspection, standardization, export promotion and market research, require direct budgetary support. A limited number of activities can be partly or wholly self-financed: these include export insurance, export inspection, industrial parks and free trade zones, market news and information, and several others. International assistance agencies can be called upon for help. Countries should select and give priority to the activities they can afford, and then

develop new ones as exports increase. It is better to have a few adequate facilities than many inefficient ones.

In specific problem areas it is sometimes possible to have the industries involved finance their own technical institutional assistance. Customers can often play a vital role, particularly in technical assistance. For example, it was possible to interest an American shoe importer in three developing Korean shoe manufacturing companies. These companies had potential but were not able to meet the quality and style requirements of the American buyer. The importer supplied two full time technicians for one year to assist these companies, with an agreement for exclusive U.S. representation. Subsequently the company purchased large volumes from the three Korean companies. Many buying organizations and traders use the expert knowledge that their buyers have, and will give technical assistance to future sellers. Travel for the purpose of visiting customer countries is extremely helpful.

Training. There is a dearth of the trained middle and top level personnel required to carry on the various phases of export development. This is true of the local managerial staff and also of advisors from the developed countries. Competent people in the field of trade are giving valuable assistance in many countries to these programs; but many of them have background in promotion without sufficient training or knowledge in development, and they need additional training in this field.

A number of international centers are giving short term training courses. The International Trade Center in Geneva, the Inter-American Export Promotion Center in Bogota, the International Marketing Institute at Cambridge, Massachusetts, the World Trade Institute (World Trade Center) in New York, and CICOM in Rio de Janeiro, are conducting international training programs. Universities in many countries are developing their own training facilities. Obviously only a few individuals can be sent overseas; most of the training must take place at home or in neighboring countries. As the needs for personnel increase in a country's developing export program, consideration should be given to establishing local training centers. Returnees from international training and guest instructors should be part of the teaching staffs. Training and teaching staffs should include theoreticians and economists and also people experienced in the practical day-to-day aspects of the problems to be encountered.

Training seminars and conferences are helpful, and they are taking on a very prominent role as part of the tendency to develop small portions of programs. These are an attractive type of activity and comparatively easy to organize; but in the opinion of this writer,

there has been overemphasis on them. Training courses should grow out of a basic export program and be related to activities going on or being planned. Trainees should have specific activities with which they can be associated upon the completion of their training programs. Seminars and conferences, likewise, should be as much as possible oriented to specific problems, and to problems in the countries in which they are held. In specialized activities such as export promotion and product identification, training should be done by professionals who also have a clear understanding of the problems in the developing countries. Fortunately, as more knowledge and experience are gained, more and more of the current training programs and activities are fulfilling these requirements; but many programs still require examination and lack relationship to the home problems.

In conclusion, there are many facets of export programs that we have been unable to discuss, for it would take a large volume to describe them all. We have spoken of the value of an overall strategy and program, but it might be well to repeat that no specific "blueprint" can be applied in all situations. Export programs must be varied and developed according to the conditions of individual countries, but in each case a general strategy, intelligently applied, is almost essential. Finally, outside assistance can be extremely useful, but no program can succeed without the desire and will of the local community to undertake the work required.

[An original article.]

Export Expansion: Exchange Rate and Trade Policy

Constantine Michalopoulos

[Exports have been held back in a number of countries by policies such as export taxation, overreliance on import controls, and reluctance to lower foreign exchange rates in accordance with domestic price increases. Appropriate shifts in trade and exchange policy can make possible, though not guarantee, an expansion of exports.]

The facts surrounding the export performance of less developed countries (LDCs) in the last decade are well known: LDC exports in the 1960s grew almost twice as fast as in the 1950s, 6.6 percent versus 3.5 percent, but more slowly than exports of developed countries (DCs)—around 9.6 percent; however, there is considerable controversy about the factors responsible. In particular, there is disagreement about the relative importance of DC and LDC trade policies in determining the growth of LDC exports. As a result, policy prescriptions on how LDCs can expand exports hinge greatly on the conclusions one reaches about what has impeded LDC export growth in the past.

In general, the factors affecting LDC export expansion fall into two broad categories: those that affect demand and those that affect supply. Within each category it is possible to distinguish the effects of policy and the effects of markets and institutional forces. Since DCs provide by far the largest markets for LDC exports, LDC spokesmen have frequently emphasized that factors which adversely affect the demand for LDC exports, and particularly DC poli-

Mr. Michalopoulos is with the economic staff, U.S. Agency for International Development (AID), Washington, D.C.

cies, are primarily responsible for the slow LDC export growth. By contrast, DCs have stressed limited LDC supplies of exportables and LDC policies affecting supply as the main determinant of LDC export growth. The debate has often been acrimonious, particularly in international bodies such as the United Nations Conference on Trade and Development (UNCTAD), with DCs and LDCs blaming each other for the problems afflicting LDC export growth. As is often the case, there is merit in the arguments of both sides.

It is extremely important that the factors affecting LDC exports be placed in the proper perspective. Evidence is accumulating that there is a strong positive correlation between LDC export performance and overall LDC output growth. While the interaction between export and output growth is quite complex, policies affecting export growth are crucial to LDC attainment of overall growth objectives. The present paper discusses the factors affecting LDC export performance in various categories of LDC exports. I intend only to indicate areas where shifts in the direction of LDC trade and exchange policy will result in increased LDC exports, rather than undertake the more difficult task of assessing the relative importance of such policy shifts.

Demand Constraints

Sluggish demand is mainly present in LDC exports of primary commodities. The main reasons are: a) a low income elasticity for foodstuffs; b) the development of synthetic substitutes; and c) the presence of high trade barriers in the developed countries. These three factors have been responsible for creating an atmosphere of export pessimism in LDCs about the prospects of their primary exports.

The low income elasticity of demand for primary exports has been well documented. In the U.S. the income elasticity for raw materials and foods has been estimated to be 0.6 and 0.3 respectively, compared to an elasticity of 2.6 for finished manufactures (H. S. Houthakker and S. P. Magee, "Income and Price Elasticities in World Trade," The Review of Economics and Statistics, May 1969). UNCTAD projections of LDC exports to DCs, based on the latter's projected income growth, show that over the 1970s developed countries' imports of manufactures will increase at an annual rate of at least 10 percent compated to only 2 percent for foodstuffs and 1 percent for raw materials excluding petroleum. Underlying these projections are three well known phenomena: a) Food consumption grows proportionately less as income grows. b) DCs impose trade controls to protect their domestic agriculture. U.S. and the European Economic Community price support programs in several commodities encourage expansion of agri-

cultural output to the detriment of competing products produced more efficiently by LDCs. Sugar is a good example of such a commodity. c) As far as raw materials are concerned, there is a long-term technological trend of declining amounts of raw materials used per unit of finished product. At the same time, several commodity exports are subject to considerable pressure from synthetics. The pressure is felt primarily in five commodity groups: rubber, cotton, jute, wool and hides. These commodities account for less than 8 percent of total LDC exports, but they often constitute the major source of foreign exchange receipts in individual countries.

For manufactures there is little reason to believe that overall demand considerations pose constraints to LDC export expansion. The main concern on the demand side stems from the structure of DC tariff protection and the stringency of non-tariff barriers that DCs impose on imports from LDCs in selected categories of commodities. DCs, just as LDCs, tend to protect finished manufactures more than intermediates, and intermediates more than raw materials. Such a structure discriminates against imports of manufactures by raising the rate of effective protection to domestic producers of finished goods. The non-tariff barrier problem is particularly acute in textiles, where the long-term cotton textile agreement has tended to limit LDC export expansion to most developed countries. Similarly, in more recent periods the U.S. has imposed quantitative controls of synthetic textile imports. LDCs interpret such restrictionist measures to mean that if they attempt to penetrate DC markets for manufactures their efforts will soon be frustrated by the imposition of restrictions. This is an attitude that parallels the export pessimism on the primary side but is much less justified by the facts. LDCs' exports of manufactures to DCs have been growing at a rate of close to 14 percent per annum in the 1960s and are likely to grow at a similar pace in the 1970s despite restrictions imposed by DCs.

Given these demand conditions, what counter measures can the LDCs take? Clearly, there is little LDCs can do about DC restrictionist policies. Most of these policies are designed to protect the DC agricultural sector or isolated ailing manufacturing sectors. The problem here for the DCs is to devise adjustment assistance measures designed to move resources out of the protected sectors. But this problem by its very nature will take time to solve. In the meantime, LDCs can take these actions to deal with adverse demand trends in primary exports: First, with demand conditions generally adverse, it is even more important that they maintain their competitive position and at least not lose ground to DCs in terms of the share of world exports of primary goods that they supply (see below). Maintenance of a strong competitive position is also important in resisting pressure from synthetics. While substitution by synthetics is partly a result of autonomous technological changes, it is also in-

duced and accelerated by high LDC prices. Second, LDCs can combat the effects of low income elasticity for foodstuffs in a number of ways: a) They can increase the level of processing. The income elasticity of demand for processed foods is four times larger than that of crude foodstuffs. b) They can move into lines with higher elasticity, such as livestock production or vegetables.

Supply Considerations

On the supply side, developing countries face two main tasks: First, they must see to it that their supply of primary commodities adjusts properly to changing world demand conditions. Second, given the overall stagnant demand for primary goods, they must devote their attention to developing new exportables, particularly in the area of manufactures. Unfortunately, it seems that LDCs' export policies in the last decade have not been as successful as they could have been in attaining these objectives and that, in fact, the most important constraint limiting LDC exports from the supply side is the LDCs' own export policies. A consensus has been emerging among economists that a good many developing countries, in their efforts to promote industrialization, have unwittingly discouraged export growth. (See for instance: B. Ballassa, The Structure of Protection in Developing Countries, Baltimore: The Johns Hopkins University Press, 1971, and I. Little, T. Scitovsky and M. Scott, Industry and Trade in Some Developing Countries: A Comparative Study, London: Oxford University Press, 1970.)

Export taxation. Two sets of policy measures have hurt their export potential. The first, with the most obvious detrimental effects, has been the taxing of traditional primary exports. Taxation has been levied either directly on exports, or indirectly by unfavorable exchange rates for traditional exports within a multiple exchange rate framework. For example, in India most important primary commodity exports are singled out for taxation; in 1968 the ad valorem equivalents of export duties ranged from 16 percent on tea to 22 percent on some jute products. In Ghana, the effective exchange rate on cocoa exports in 1969 was .54 Cedis to the dollar compared with 1.01 C/$ for all other exports. Brazil has taxed coffee exports for a long time, in part because of revenue considerations.

The main reason for such taxes, in addition to the desire to raise government revenue, has been the LDC belief that they possess considerable monopoly power in the international markets for primary products. This implies that the price elasticity of demand for their commodities is low and that, as a result, a high exchange rate (one which raises external prices) would maximize total foreign exchange receipts. It may be true that overall

price elasticity of demand for primary goods is relatively low. Nevertheless, the important factor is that, even with low overall elasticities, the elasticities facing individual countries could be quite high if there are a number of countries producing the commodity. Less developed countries have tended consistently to overestimate the degree of their monopoly position, and thus underestimate the price elasticity of demand facing their international markets. At the same time, taxing of primary exports has tended to discourage their production by reducing profits. The results have been both overpricing and supply limitations which have reduced the share of developing countries in world exports of primary commodities and encouraged the development of synthetics. If developing countries as a group had maintained the percentage of world exports of primary commodities in 1970 that they had a decade earlier, their total exports would have been $1 billion higher.

A country's export growth depends both on world demand for the commodities it produces and its competitive position in the market for these commodities. If demand is rising, and the country's market share is constant, its total exports will rise; they might rise rapidly even if its share is declining. However, if demand is stagnant or rising very slowly, as has been the case with most primary commodities, a country can expand its exports vigorously only by increasing its share of the market. Many LDCs did not keep their share of the market due to the price policies they pursued, and since demand had been stagnant this meant that their exports stagnated or in some cases decreased. Various studies have shown that the developing countries with the more successful export records expanded exports to a large extent by increasing their share of trade in traditional commodity groups, at least partly in direct competition with products from developed countries, rather than by riding the crest of an expanding world demand for specific commodities (I. Kravis, External Demand and Internal Supply Factors in LDC Export Performance, AID, 1969). These findings attest to the importance of maintaining an exchange rate and overall pricing policy that enables the country to compete internationally as a means of increasing overall exports.

Export taxes should be imposed only after a very careful examination of the alleged monoply position that the country enjoys in international trade of individual primary commodities. Efforts should be made to increase domestic taxation and reduce the reliance of government on foreign trade taxes for the bulk of their revenue. Export taxes may be inequitable when they arbitrarily penalize one sector in the economy, and they also tend to be inefficient in that they penalize a sector crucial to the economic development effort because of the foreign exchange earnings it generates.

Effects of import controls. The second and perhaps most important impediment to LDC export expansion has been the establishment in LDCs of extensive import controls. The latter have been imposed for two fundamental reasons: a) to contend with LDC balance of payments disequilibrium, and b) to promote industrialization by providing a protected market to domestic industry. Developing countries have placed far more emphasis on saving foreign exchange through import substitution than on earning foreign exchange through export expansion, and the last 20 years have witnessed the imposition of numerous controls ranging from tariffs to quantitative restrictions, licensing and total import bans. These, in turn, adversely affect exports in various ways: a) Inputs whose importation is restricted become more expensive and, as a result, domestic production costs of exportables get higher. b) More importantly, the existence of import controls makes it possible for the foreign exchange rate for exporters to be higher than would have been the case if balance of payments equilibrium were to be maintained without controls, so that the exporter receives less domestic currency for a given quantity of exports. As a result both traditional primary exports and potential industrial exports have suffered. c) There are few incentives to increase productivity in industries operating in a sheltered market; hence it is difficult for such industries to make the transition from selling domestically to selling abroad, and the expansion of exports in new lines of manufactured goods is inhibited.

Governments of LDCs have undertaken a number of measures to redress this imbalance of incentives: tariff rebates are offered to bring down the cost of imported inputs to exporters to that of their foreign competitors; where imports are licensed or banned, exporters often obtain special exemptions allowing them to import such commodities freely. Some countries have tried to deal with the higher profitability of the domestic market by legislation stipulating that given industries are required to export a certain percentage of their output if they are to obtain licenses to import inputs used in their production for the domestic market. But this is not the way to promote economic efficiency or develop a sound export program; producers may simply dump their output in the foreign market for what they can get, relying on the high profits they enjoy in their protected markets to offset losses they incur when they sell abroad. In addition, more and more countries are resorting to subsidizing exports to offset the bias created by import controls, either by direct payments or indirectly through tax reductions for exporters.

The stimulus to industrialization supplied by import controls, and also the balance of payments adjustment which such a policy requires, could be provided more effectively through lowering exchange rates than by instituting controls with patchwork efforts to

offset their bias. Yet most developing countries have, until recently, eschewed this approach in favor of import controls. In theory a combination of export subsidies and import controls could be devised which would be equivalent in its effects to a uniform reduction in the exchange rate. In practice, however, it is very difficult to devise and almost impossible to administer a system of subsidies for exports and controls for imports which is directly equivalent to exchange rate adjustment.

Countries using export subsidies have tended to apply them as selectively as import controls. This stems from the fundamental belief of governments in developing countries that if the price mechanism is allowed to operate unhindered the resulting resource allocation would be incompatible with the national development objectives. Thus governments intervene to correct the price system by providing differential incentives, both for exports and for domestic products, according to their notions of the importance of different products in attaining development objectives. The operation of unregulated prices and markets in most developing countries is, to be sure, deficient in many ways. However, the well-intentioned interventions of governments have in practice too often been based on arbitrary criteria and ad hoc decisions, so that overall priorities are unclear or ill-defined. The result has commonly been a set of incentives which, in their actual impact on producers, do not improve the efficiency of resource allocation or promote national development objectives. Furthermore, the control system usually needs a large bureaucracy to administer the multitude of complex exemptions and incentives, so that entrepreneurs often find it more profitable to spend time and resources dealing with the administrative machinery than in improving productivity in their operations.

For a successful export development effort, experience has shown that it is desirable to make a drastic break from import controls. The developing countries with the most successful postwar export performance, such as Mexico, South Korea, Taiwan and Greece, abandoned stringent import controls early in their industrialization efforts. A few others, such as Brazil, have done so only in recent years but with remarkable results in increased exports. Furthermore, the governments in all these countries have not been reluctant to lower their exchange rates as the need arose.

For the majority of the developing countries, however, where extensive import controls continue to exist, the shift to a non-discriminatory trade and exchange regime free of controls would not be an easy task. To eliminate the bias against exports, import controls must be reduced. But if import controls are reduced and the exchange rate remains overvalued, many of the industries established under the shelter of controls are likely to suffer severe dislocations, and the balance of payments will be subject to severe strains from

a rush of additional imports. Thus, a reduction of discrimination against exports, in most instances, would require a parallel currency devaluation; this would also provide a stimulus to exports, one that would render export subsidies unnecessary.

Liberalization of trade controls does not imply that countries ought to abandon efforts to promote industrialization. Rather, the promotion of industries should be undertaken primarily through fiscal measures which do not discriminate between production for the domestic or the foreign market. If firms deserve assistance on infant industry grounds, the assistance should not be given through trade controls but, rather, through a reduced rate of profit taxation or perhaps even direct subsidies to production, not to trade. In countries where the fiscal incentives the government can provide are limited, trade controls could be resorted to as a second best solution. But in such instances controls should take the form of uniform tariffs and subsidies of moderate level.

Economists have often demonstrated that the theoretically optimum trade policy for developing countries is the adoption of, at most, low-level uniform tariffs and subsidies in combination with an exchange rate policy which permits continuous and flexible adjustment of rates in accordance with rising domestic prices. However, reaching this optimum is always difficult. Given the height and disparity in existing LDC trade controls, it is probably wise that their overall reduction and standardization be taken in a series of steps over time to enable domestic producers to adjust. A gradual transition from rigid quotas and administrative controls to equivalent tariffs and a progressive reduction of tariffs, accompanied by devaluation is the generally recommended procedure.

The success of a developing country's export development effort hinges in large measure on the adoption of appropriate overall trade and exchange policies. Trade and exchange policies act as the overall constraints within which export promotion efforts must operate. Export promotion efforts can be useful in providing market information, improving quality control and generally establishing a favorable climate in which exporting is seen as a feasible, potentially profitable and hence desirable activity. However, if the limits set by trade and exchange policies are too narrow and existing trade controls introduce a basic bias against exports, export promotion efforts are likely to prove futile. On the other hand, good exchange rate and trade policy permits but does not guarantee successful export development. Proper trade and exchange policies can thus be viewed as the necessary but not sufficient conditions for successful export development.

[An original article.]

Export Financing

[Local banks in the developing countries must directly supply most of the short-term financing needed for export expansion; foreign banks have a useful role in support of local banks. Governmental support of incentives to export financing, whether concessional loan terms or by special lending institutions, can also be valuable.]

ONE. . . . . .Paul D. Lucas is Vice President, Manufacturers Hanover Trust Company, New York.

The Banker's Role

Successful export development and export financing in a less developed country (LDC) require not only the commitment of the government in providing initial impetus, but also the existence of a domestic banking system equipped to handle the financing needs of the exporting sector. The domestic banks must first provide such local resources as may be required for export financing, and second, develop relationships with overseas financial institutions (principally banks) which in turn will provide a source of external funds for domestic use.

The domestic bankers must be prepared to lend to local exporters to the extent that their banking resources permit, but obviously there will be limitations on the amounts, terms of financing, and perhaps on the types of commodities that can be financed. Such export lending may or may not be extended in total amounts which would encourage the full export capacity from domestic production; this amount may be regulated by agreements with the country's financial authorities. At some point, where local banking either cannot or will not assist further in export financing and more is needed, it may become mandatory that the LDC government step into the picture. Normally this is done through the country's central bank, which takes actions to increase the financial capacities of

the commercial banks. It may also be done, as in many Latin American countries, by establishing a government corporation which has as its purpose lending funds to approved applicants when these are not available from normal banking sources. While not a LDC, Japan offers the best example of how its central bank, the Bank of Japan, has stimulated her export growth by offering her local banks inexpensive refinancing through export bill rediscounting at preferential rates. The local commercial banks benefit from the added liquidity provided in such a system; and to the extent that his low cost financing is passed on to the exporter, export prices can also benefit from lower costs.

The existence of a domestic banking community both geared to and interested in such export financing becomes all the more vital to export development when one considers that it provides the link to the introduction of foreign capital. This link is expressed in the development of foreign banking correspondent relationships between the domestic banks and overseas financial institutions. As the domestic bank demonstrates its capacity to grow within sound and prudent banking lines, and to the extent that it develops an overseas commercial business, it is in a position to seek a relationship with one or more overseas banks (in this description I will call it an American bank), with whom agency arrangements can be concluded as a basis for mutual business dealings. These patterns of business exchange will lead the American bank to extend credit and/or funds to the domestic bank or possibly its customers, which funds are then available for export financing. The determining criterion in extending credit here is that overseas banks would normally prefer to accept the credit of an approved local bank over that of a local company or individual, for reasons of collateral or accessibility of assets. Once this avenue of credit is available to the customer or his bank, it can be obtained in one of several ways. To consider these ways, let us distinguish export financing of short-, medium-and long-term character; each requires a different set of considerations, which in turn affect the source and nature of funds to be obtained.

Short-term financing. Credits which range up to one year are chiefly used for the financing of agricultural products (cash crops) and some light durable or consumer manufactures. The working capital for production and marketing of these goods is normally provided by borrowings from local banks; external capital may enter the picture indirectly, in support of the local banks, in various ways. Some examples will illustrate how this works.

Example 1. Sugar crop financing in the Philippines is usually geared to the timing of the crop cycle, normally about eleven months. At the different stages of land preparation, cane planting, growth

period, cane harvesting, and then the milling, funds are required either to tide the planter over the growth period or to pay for labor costs such as harvesting. Fertilizer has to be bought prior to planting, and this requires financing from the local bank. In other words, funds have to be programmed for disbursal to meet the grower's demands at different stages. To the extent external capital may be required, it can be obtained by the overseas bank extending a crop-financing facility either to the planter under guarantee of the local bank, or perhaps to the domestic bank for relending to the planter. At the point the sugar is milled and warehoused for export to the U.S., a quedan (warehouse receipt) is issued against the specific lot of sugar; this instrument can then be used to secure warehouse financing either from the domestic bank or from the foreign bank.

Example 2. In Okinawa, a problem arose when the harvesting season of the pineapple crop occurred during the first half of the year, but the principal buyers of the canned pineapple (Japanese) could not take delivery of the finished product until late in the second half of the year. Storage of the canned pineapple together with refrigeration facilities had to be arranged and financed for about six months—a typical example of pre-export financing.

Example 3. A small but reputable company in Malaysia obtained a medium-term export contract for its crop of palm oil. Because the company had exhausted its unsecured credit facilities from its local bankers due to a previous loan for land purchase, the local bank was unable to extend additional credit for crop planting. The local bank discussed this problem with us, and our bank arranged a dollar credit facility to them for their relending to their customer against an assignment of proceeds under the sales contract. These funds were then considered to be secured financing, and with this the local bank could involve itself in this transaction.

For light manufacturing or processing industries which take in basic raw materials for finishing into exportable products, funds provided by either local or foreign banks can be programmed to the manufacturing turnover period, or perhaps to the export sales cycle. Generally speaking, in such short-term financing, it is expected that the proceeds of sale of the exported item will be used to repay the financing provided by either the local or foreign bank for that specific shipment.

Example. A Korean company imported logs from Indonesia which were processed into plywood veneer. The entire production of the Korean firm was to be sold to a U.S. company on an annually negotiated firm sales contract. Based on our bank's relationship with the U.S. company, and through the medium of the exporter's bank with whom we had a correspondent relationship, we provided funds

for the exporter to buy the logs, with loan repayment based upon receivables from the U.S. company.

Medium-term financing. Credit extended for one to three years is usually required for plant expansion or capital expenditure purposes. (It should be noted, however, that the increase of exports is only an indirect result of either medium-or long-term financing; the primary result is higher industrial productivity, part or all of which may later find its way into actual exportation.) A country needing such credits will most likely have progressed from basic primary product exports to a more developed level of export capacity which requires more complex and costly productive means. The availability of funds from the domestic banks might become constricted, however, due to their inability to provide medium-term financing from their short-term deposit base. Short-term borrowings might be rolled over on successive maturities, perhaps resulting in a lower cost of funds; but the main disadvantage to this is the unpredictability of when such short-term borrowings might have to be curtailed or even stopped. The domestic bank, however, can be instrumental in attracting medium-term financing from abroad. If the end-user of the funds is not yet creditworthy by international standards in obtaining unsecured credit, the foreign bank would then require either the local bank's guarantee or a pledge of some accessible collateral satisfactory in form and substance to the lending bank.

It is at this point that the LDC government may be best able to assist export development by providing medium-term funds to qualified exporting companies. This extension of credit could be effected through various means; perhaps through a central bank medium-term loan program administered through the local banks, or perhaps by the issuance of short-term notes or bonds, the proceeds of which could be directed towards the export sector. A more common method, mentioned above, is the creation of a government corporation specifically designed to lend credit and/or assistance to exporters on a medium-or long-term basis. An example would be the Fondo de Promoción de Exportaciones, created by the Colombian government several years ago to render credit and assistance to exporters of other than coffee [described below]. Such agencies are usually funded from governmental budget allocations; issuance of domestic public paper is another means, as is also the securing of a line of credit from some overseas financial institution under which funds can be drawn on a relending basis to qualified concerns. To the extent that such an agency is recognized for its intrinsic value to the country, it may qualify for either an equity investment by, or a line of credit from, an official international organization such as the World Bank's International Finance Corporation, or perhaps the U. S. Export-Import Bank.

Long-term financing. This range of credit covers three to twelve years generally, and is used for the larger capital expenditures for industrial plant, infrastructure, or natural resource development. As a country acquires enlarged markets overseas that create or insure continuing demand for its industrial exports, it will need to expand its productive capacity. To the extent that long-term credit is not available from domestic banking or money markets for this purpose, term credit from overseas institutions is not difficult to arrange if underlying conditions of lending are adequately met. Infrastructural financing—although it may ultimately give rise to increased export capacity—is usually financed by taxes or carried on through capital generated by governmental borrowings from international organizations such as the World Bank, the Asian Development Bank, the Export-Import Bank of the U.S., and others. Natural resource development is perhaps the latest field in which international financial institutions have joined together in specific projects designed to exploit a potential natural resource.

Example. An example of this last is the financing by a consortium of international banks of an iron ore project in Australia. This brought together, besides the banks, an international mining company, an Australian mining company and other private interests, as well as Japanese steel mills and commercial firms. The primary objective was to develop a source of iron ore for export under long-term contracts which would assure funds for orderly repayment of development costs. This new venture also made available a supply of iron ore for domestic consumption which would not have been economically feasible as a project for domestic needs alone. The project included not only the extraction of the ore but the creation of a new town, port and harbor, complete with facilities for the requisite living conditions.

[An original article.]

TWO. . . . . The Secretariat of the United Nations Conference on Trade and Development (UNCTAD), Geneva

Incentive Schemes in Export Financing

Many of the incentive schemes which governments use to encourage exports operate through the medium of capital. They may take the form of capital grants, or loans at preferential rates of interest. They may relate to any of the stages of processing exports—fixed capital requirements, working capital, capital to finance the sale, and insurance for the sale of the final product abroad.

In the last two decades industrialized countries have actively encouraged exports, especially of consumer and capital goods, by offering extended payment terms to their buyers. These credits are

generally extended within the framework of the existing banking system on terms that provide for repayment over periods ranging from one to five years and, in certain cases, longer periods. Moreover, as an added inducement to export, these credits are usually offered at interest rates below those charged on finance for domestic sales. To match the growing demand for export credit in developed countries, "factors" and "confirming houses" are also playing an increasingly important role in the provision of shorter term finance. A number of developing countries have followed the lead of the industrialized world in providing export credit facilities. Some examples:

Argentina: The Central Bank can arrange for the financing of exports during the manufacturing stage by making funds available at 8 percent interest—well below the normal rate—up to 60 percent of the value of the exports. Short-term credits (up to six months) are provided for exports of all kinds of goods by the commercial banks as part of their normal business. In addition, Argentina has a special program designed to promote exports of non-traditional manufactures. Under this program, the commercial banks are provided with refinance facilities at the Central Bank of up to five years in the case of durable and semi-durable goods and up to one year in the case of other products. The maximum amount of financing is 80 percent of the f. o. b. value of the goods exported—the importer being required to make a prior cash payment of not less than 20 percent of the value—and the cost of such credit is normally about 6 percent, compared with a maximum internal interest rate of 15 percent. In turn, the Central Bank can refinance medium-term export credits (up to five years) with the Inter-American Development Bank in connection with its program for the refinancing of intra-regional sales of capital goods.

Taiwan: Since 1959, financial assistance in the form of export credits has been granted to exporters. The credits are in the form of export loans at 7.5 percent per annum, a rate only one-half of the normal bank rate. Certain firms can also obtain loans at a 7.5 percent rate of interest for purchasing imported raw materials.

Colombia: Nearly all export credit financing is provided by the Fondo de Promoción de Exportaciones, an autonomous agency supervised by the Superintendent of Banks, which operates as an annex of the Colombian Central Bank. Most of the Fondo's resources are derived from a surtax of 1.5 percent imposed on Colombian imports. The Fondo refinances export credits granted to foreign buyers by Colombian exporters and financed by the commercial banks or finance companies. The credits eligible for refinancing are those granted in connection with the export of certain specified goods and the maximum maturities must not exceed six, twelve, or twenty-four months depending on the type of goods involved. The Fondo

can also refinance credits granted in connection with exports of capital goods for periods of up to five years and even longer. The annual interest on export credits is 9 percent, 7 percent being charged by the Fondo for refinancing. In addition, the Fondo is prepared to grant credits of up to five years for studies of the expansion and diversification of Colombian exports, of up to six months for travel undertaken for export promotion purposes, of up to one year for samples and of up to two years for participation in fairs and permanent exhibitions and for advertising.

India: The bulk of export finance is provided by commercial banks. Their ability to make advances has been facilitated by the Reserve Bank of India providing refinance facilities. Since 1963, the banks can obtain advances from the Reserve Bank against "usance export bills" purchased or negotiated by them. The banks are entitled to borrow at Bank Rate from the Reserve Bank against their holdings of rupee usance export bills, but only if they do not charge the exporters interest at a rate exceeding 1.5 percent above the Bank Rate. The Industrial Development Bank of India provides refinance for medium-term export finances at 4.5 percent interest, subject to the condition that the financing bank does not charge exporters a rate higher than 6 percent. In 1968, the Reserve Bank of India initiated an Export Credit (Interest Subsidy) Scheme; commercial banks are subsidized by the Reserve Bank to the extent of a quarter of the interest income accruing to them from export credits. This represents an effective rate of subsidy on export credits of 1.5 percent per annum.

Israel: Short-term export credits in Israel are financed mainly from two special funds, the Industrial Export Fund which deals solely with industrial goods and handles most export credit, and the Agricultural Export Fund, established jointly by the commercial banks, the Bank of Israel and the Government. Interest is charged to the exporters at the relatively low rate of 6 percent. The commercial banks may rediscount export credit bills of more than one year with the Bank of Israel at a rate of 5 percent if the borrower is not charged more than 6 percent.

Turkey: The interest rate charged on export credit is 6 percent, which is significantly below the domestic rates of interest.

Venezuela: Export financing is the responsibility of the Corporación Venezolana de Fomento; it offers exporters finance for the purchase of raw materials and for maintaining stocks of finished products. Where evidence is presented of the likelihood of exports, the credit needed for purchasing raw materials is extended for eight months at an interest rate of 6 percent. The Corporación provides inventory finance on conditions which vary with the types of goods. It also supplies short-term export credits—normally six months—at 6.5 percent

per annum. In conjunction with the Inter-American Development Bank, the Corporación also provides medium-term credits, of up to five years, to exports of capital goods on an intra-regional basis; it normally finances only 80 percent of the value of the order, and charges 6 percent interest.

Export credit insurance. Like the provision of export credits themselves, export credit insurance has become an instrument of export policy in the developed countries. Their experience has shown that the provision of export credits by the banking system is greatly facilitated by the availability of export credit insurance, and a number of developing countries have instituted export credit insurance schemes. These countries include: Argentina, Chile, India, Israel, South Korea, Mexico, Pakistan, and Venezuela; Malaysia, Malta and the Philippines have requested UN aid in establishing such facilities.

Normally export credit insurance is provided by quasi-governmental institutions. Of major significance is the fact that these institutions are usually prepared to insure export credits against non-repayment as a consequence of political events. With some exceptions, the institutions will also provide insurance against commercial risks, such as default in repayment due to bankruptcy of the buyer. It is clear that the ability to insure against risks of both kinds is conducive to the provision by the banking system of export credits at rates below those which would apply in the absence of insurance. The export credit insurance institutions are usually intended to be self-supporting, that is, they charge insurance premiums which, in the long run, tend to yield neither a profit nor a loss; however, such institutions generally have ultimate recourse to a government guarantee.

[Excerpted from Incentives for Industrial Exports. New York: United Nations, 1970, TD/B/C.2/89/Rev. 1, pp. 47-53. UN Sales No. E.70.II. D.8.]

Export Incentives

Secretariat of the United Nations
Conference on Trade and Development
(UNCTAD), Geneva

[Two main types of financial incentives to exports are discussed, those relating to foreign exchange and those affecting taxes. In Part I the broad economic justifications for their use, and some of the relevant policy considerations, are analyzed. In Part II the types of incentive measure in common use are described with examples.]

Part I

Three broad reasons can be advanced for providing financial incentives to exports, especially of manufactured goods. First, it is a central aim of economic policy in many countries to develop manufacturing industries. The most straightforward way of fostering manufacturing would be direct subsidization which would enable domestic manufacturers to compete with foreign producers in both the domestic and the export markets. In practice, countries have been reluctant to use this straightforward approach for a number of reasons, one of which is the difficulty of raising revenue to finance such wide-ranging subsidies for production. Normally countries foster their manufacturing industry by tariffs and, in some countries, by quantitative import restrictions as well. But tariffs and quantitative restrictions promote manufacturing only for the home market; they do not promote manufacturing for export—indeed, they might divert manufacturers from the export market to the more profitable home market. If the aim is to expand manufacturing industries and to encourage exports, it is better to foster an "outward-looking" approach as well, with protection for the home market being balanced by "protection" for exports: in other words, tariffs or import restrictions should be associated with export incentives. The provision of export

subsidies at rates similar to import tariffs would lead manufacturers to choose between selling to the home market and selling for export on the basis of relative returns that accurately reflect relative social benefits. Manufacturers would then be induced to specialize more, on the basis of comparative costs, and the country would obtain increased benefits from trade without giving up its objective of fostering the development of manufacturing industries.

The above justification may be applied to three types of countries. First, there is the country which already has a substantial and perhaps quite sophisticated manufacturing sector producing for a fairly large home market and fostered by tariffs and possibly import restrictions. The manufacturing sector does not export in significant quantities because of the absence of incentives equivalent to the protection for home market sales. Exporting, however, might yield economies of large-scale production. The second type is the small economy where it is virtually impossible to develop manufacturing for home-market sales only or to realize reasonable economies of scale. In such circumstances, export manufacturing must be developed almost from the beginning, supplemented by home-market sales. In this type of country, manufacturing industry needs to be specialized; the existence of regional or sub-regional integration to provide a wider base for manufacturing production is extremely important for the small economy countries. Thirdly, there is the country with a potentially substantial domestic market but where manufacturing industry has not yet been fostered very actively, though the intention is that it should be encouraged in the future. Here too, the general argument for encouraging manufacturing equally for the home market and for exports applies. It would be more economic to develop an "outward-looking" manufacturing industry right from the beginning than an "inward-looking" industry.

A second justification for incentives to exports of manufacturers may rest on the "infant marketing" argument, which favors giving particular assistance to exports at rates exceeding protection rates for home-market sales. This is a version of the familiar infant industry argument that a learning process will in time reduce production costs or raise the quality of output and so make an industry competitive; this learning process may involve external economies, so that there may be some justification for financial concessions to an industry undergoing it. But the concessions would need to be temporary only. A similar argument could be advanced concerning the opening up of new export markets which requires an initial investment in the collection of information and the exploration of export opportunities, in learning the business of marketing, in creating sales contacts and goodwill. It can be argued that manufacturers in developing countries are "infants" in exporting, and they should be assisted while they are growing up.

The "infant marketing" argument is subject to a proviso and should be treated with caution. If the benefits from the learning process in marketing, or from the investment in goodwill, go only to those exporting firms which actually make the investment—that is, if the benefits are internal to the firms and there are no other benefits to the economy—and if, in addition, firms could finance such investment on the capital market at rates of interest which measure the social cost of capital, then there is in general no case for subsidization on "infant" grounds. But the absence of either one of these two conditions may justify subsidization. The benefits from the initial investment may not be entirely internal to the firms concerned—that is, there may be "external economies." The firms in a country that pioneer the export of manufactures may successfully improve the export consciousness of other firms and hence draw attention to available profit opportunities; they may train experts in exporting who can then assist other firms; and they may spread in their own country a general knowledge of techniques for penetrating foreign markets. These pioneers in exporting may also create goodwill from which other exporters of their country will eventually benefit. But unfortunately there is another possibility, namely that they may create ill-will. If the quality of their products is poor and inconsistent, if there are delays in delivery, or if their methods of transacting business are not of the highest standards, then they could create "external diseconomies" for other exporters or potential exporters.

Even if there are no external economies or diseconomies, it may not be possible to finance export market development at rates of interest which measure the social cost of capital. This problem is unlikely to arise if the exporting firms concerned happen to be foreign-owned; they would not have any difficulty in financing their temporary losses provided that the expected rates of return are reasonable. But domestic firms may find it difficult to obtain capital for unfamiliar export promotion or "infant exporting" purposes. Since there is likely to be great initial uncertainty involved in venturing into unfamiliar export territory, the capital required is bound to be high-risk capital, the type of risk being unfamiliar to the business community. The absence of developed capital markets in many developing countries, and the extreme caution of suppliers of finance where new types of enterprises are concerned, is a large problem.

Finally, the purpose of assisting exports of manufactures may be justified as compensatory. Concerning the compensation for a country's own policies: it may be that the taxes or tariffs charged on a product have an adverse effect on its export; and the purpose of export subsidies or exemptions of exports from payment of taxes and tariffs is to compensate for these, so that on balance exports are no lower (or higher) than they would be in the absence of tariffs, taxes and subsidies. Many of the schemes for assisting exports which are

actually used by governments are probably intended to be compensatory. This is also true of export subsidies, whether direct or indirect, which are imposed because of an overvalued exchange rate.

In addition, a country may introduce some form of export subsidy to compensate for tariff barriers to its exports in the importing countries, or to compensate for the subsidizing of exports in the countries with which it is in competition. The pros and cons of this kind of compensation for external conditions are rather different from those applying to compensation for internal policies more amenable to a country's control; the alternatives may be more limited in practice by external realities than by internal constraints.

Appropriate Patterns of Export Incentives

The following considerations are relevant in determining the most appropriate pattern of export incentives and their "rates of concession." The importance of each consideration will vary from one country to another, and it may often be necessary to balance one consideration against another, there being no simple way of striking the balance. We shall, in this section, use the term "concession" as a shorthand for favorable financial treatment of exports, whether it refers to a subsidy payment by government, a remission or exemption of taxes, or a favorable position in foreign exchange and import regulations.

1. There are strong grounds for simplicity, for simple rules and simple criteria, in other words for export concessions at a uniform ad valorem nominal rate applying to all manufactured exports, or perhaps for two or three export subsidy rates applying to clearly specified categories of exports. Simplicity economizes on the administrative resources both of government and of exporting firms. It makes numerous classification decisions superfluous, and avoids complicated administrative and accounting procedures. Simple schemes are more easily understood by the public, the political leadership and the business community; their economic effects are easier to analyze, and they are more readily adjusted to meet changing conditions. Simple schemes will minimize the opportunities for corruption, i.e., reduce the extent to which special interest pressures can be exerted on administrators and political decision-makers to influence the operation of the schemes. (On the other hand, reasons for differential treatment of products are noted below.)

2. Another consideration affecting an appropriate pattern of export subsidy rates is the likely costs involved. Governments will have to bear in mind the difficulty of imposing and collecting taxes when committing government revenue to subsidizing exports or in

sacrificing revenue which may be needed for other purposes. [As noted on p. 90, budgetary sacrifice is small when new exports rather than existing exports are favored.]

3. Given a desired increase in exports, the elasticities of domestic supply for export should be borne in mind in framing an export incentive system, that is, the extent of a probable increase of production in response to the concession should be estimated. In the case of some exportable goods where the domestic export supply elasticity is low, a given rate of export concession may lead to only a small rise in exports. In an extreme case, the effect may simply be to raise the incomes received by producers for the existing quantity of exports, thereby resulting in a redistribution of income from the taxpayers to these producers. On the other hand, the same rate of concession may lead to a large rise in certain other exports. The cost of the concession per dollar of extra export income generated will then be considerably less than in the previous case. The important point is that export supply elasticities do differ, and sometimes quite substantially. In such circumstances the rates of export concession could be adjusted according to the estimated domestic supply elasticities. Some export incentive schemes relate the assistance to exports directly to increases in exports over a given period; this may be regarded as an indirect attempt to relate rates of concession to supply elasticities.

4. A fourth consideration affecting export concessions relates to demand elasticities and the terms of trade. One reason for giving concessions to exports of manufactures but not exports of traditional primary products, when there is an overvalued exchange rate, may be that extra exports of manufactures are much less likely to lower prices and worsen the terms of trade than are extra exports of traditional primary products. On the one hand, developing countries are only marginal suppliers of most manufactures in world markets, and hence it might seem unlikely that any significant effects on the terms of trade would result from a moderate expansion of these exports. On the other hand, developing countries as a whole, and certain of them in particular, are significant world suppliers of primary products and of certain manufactures—notably textiles and clothing, some processed food items, certain petroleum products, as well as certain light manufactures like hair and cane products. Consequently, developing countries will have to bear in mind the effects which a concessional policy might have on world prices of these exports. In particular, developing countries should avoid competitive export subsidization which leads to a deterioration in the terms of trade in their manufactures. Any one of them on its own might not significantly affect its terms of trade through subsidizing exports, but a number acting at the same time might do so. This danger is very real.

The likely reactions of the governments of developed countries would also need to be taken into account. There is no point in subsidizing an export product if the extra goods produced as a result of the subsidy cannot be exported, or will meet with higher tariffs or import restrictions in the importing countries. If a developing country provides an export subsidy, and this is offset by a countervailing duty in the buying country, then the government of the developing country has in fact transferred its revenue—the cost of the subsidy—to the government of the other country—the return from the customs revenue—and on balance exports may not increase. Retaliation of this kind by importers is less likely when export incentives are indirect, i.e., when there is not an explicit subsidy payment.

5. Export concessions will inevitably result in a transfer of real income from taxpayers to exporters, and from domestic consumers of exportable goods to the producers; this might result in a rise in their profits at the expense of real wages. This shift may be beneficial in that savings, and hence the rate of economic growth, are raised.

6. The beneficiaries from export concessions may, in certain cases, be fully or partly foreign-owned companies. In such cases the income redistribution could, in the final analysis, benefit chiefly non-residents, and if these benefits result in increased remittance of profits overseas this will reduce the balance-of-payments gains from the export stimulus. If the desire is to maximize the real national income of residents, then there may be a case for reducing the rate of effective subsidy below its normal level where the beneficiaries are in the main foreign-owned firms. On the other hand, foreign firms might show a greater elasticity of supply in response to the stimulus. This raises the numerous and complex issues concerning the gains and losses from foreign investment, and these are not covered here.

7. There may be various reasons for wishing to encourage certain types of manufacturing rather than others. In a broad sense, some types of production may yield more "external economies" than others. The concept of external economies raises large issues of development economics. It can, for instance, be argued that in some developing countries the existence of unemployment means that direct concessions to relatively labor-intensive industries may be desirable simply to increase employment. If export concessions are to be wide-ranging, and make a significant impact on the pattern of manufacturing production, they cannot be seen in isolation from the main strategic variables and structural problems of the economy and need to be tied into a country's development plan.

All these considerations are related to the pattern of an export concession structure at a given point in time. But clearly it will need to change over time as circumstances change. There must be a readiness to make adjustments. If the reason for export concessions is, at least in part, either the "infant marketing" argument or the "infant industry" argument for protection, then there is a case for starting off with high levels of concessions and gradually reducing them, perhaps at a rate clearly specified in advance. While rigidity is not desirable, it must be stressed that an even greater danger is uncertainty. A clear indication in advance as to how long export concessions will remain and on what basis, or at what rate, they will be reduced is most important if a genuine incentive to export is to result.

Part II

Figure 1 indicates the countries using different types of export incentive. This article discusses incentives related to "Foreign Exchange Rates," and incentives from the "Exemption and Remission of Taxes." Two other types of export incentive covered in Figure 1: "Input Incentives" are discussed in the article on financing of exports, pp. 98-105; "Government Marketing Assistance" refers to various types of export promotion activities.

Incentives Related to Foreign Exchange

There is a close relationship between export incentives and exchange rate policy. It has been a common experience for countries to incur balance-of-payments deficits as a result of internal inflation, heavy development expenditures and/or temporary and continuing declines in export prices, especially of primary commodities. They have then tackled these difficulties by imposing tariffs, quantitative import restrictions and other import surcharges, and by providing incentives for export. Usually the main emphasis has been on restricting imports rather than on export incentives. But, in their direct or indirect form, export incentives for the more marginal exports have often become imperative to ensure the survival of these exports, let alone their expansion. In such cases the exchange rate is overvalued and the export incentives, direct or indirect, can be regarded as part of a policy of compensating for the overvalued exchange rate.

From the point of view of the balance of payments and resource allocation, a currency devaluation is the equivalent of a uniform tariff on all imports combined with a uniform export subsidy on all exports, the rate of subsidy being the same as the rate of tariff. In a number of cases, however, for reasons that are both political and economic, countries find it necessary and sometimes unavoidable

Figure 1: Summary Table of Types of Incentives

	FOREIGN EXCHANGE RATES					EXEMPTION & REMISSION OF TAXES					INPUT INCENTIVES		GOVERNMENT MARKETING ASSISTANCE			
	Currency retention (a)	Export bonus/import entitlement (b)	Special import licenses for exporters (c)	Foreign exchange allocations to exporters (d)	Multiple exchange rates (e)	Production and sales tax (a)	Income tax (b)	Export tax (c)	Other taxes (d)	Import duties (e)	Incentives for capital including export credit and export credit insurance (a)	Other input incentives (b)	Financial assistance for export promotion (a)	Collection and dissemination of foreign market information and foreign market surveys (b)	Export publicity & exhibitions abroad (c)	Training of export managerial personnel (d)
AFGHANISTAN								*								
ALGERIA	*		*			*			*	*						
ARGENTINA					*	*	*			*	*			*		
AUSTRALIA						*	*		*	*	*	*			*	
AUSTRIA						*	*				*			*	*	
BARBADOS						*	*		*	*	*			*	*	
BELGIUM						*					*		*	*	*	
BOLIVIA					*			*								
BRAZIL						*	*	*	*	*					*	
CAMBODIA												*			*	
CANADA		*					*	*		*				*	*	
CEYLON		*					*	*		*				*	*	
CHILE					*				*	*	*			*		
CHINA (Taiwan)				*			*			*	*			*		
COLOMBIA					*		*			*	*					
CZECHOSLOVAKIA											*					
DENMARK										*	*		*	*	*	*
ECUADOR	*					*		*	*	*			*	*	*	
FEDERAL REP. OF GERMANY						*	*		*	*	*			*	*	
FINLAND											*					
FRANCE	*					*	*			*	*			*	*	
GREECE						*	*		*							
HONG KONG										*						
HUNGARY											*					
INDIA			*			*	*	*		*	*	*	*	*	*	*
INDONESIA		*														
IRAN										*						
IRELAND						*	*			*			*	*	*	*
ISRAEL						*	*		*	*	*	*	*	*	*	
ITALY						*				*	*		*	*	*	*
IVORY COAST								*		*						
JAMAICA							*			*		*				
JAPAN						*	*			*	*			*	*	
KOREA (Republic of)				*							*					
KUWAIT							*	*		*						
LEBANON										*						
LIBYA										*						
LUXEMBOURG						*							*			
MALAYSIA							*	*		*						
MEXICO							*	*		*	*	*	*	*	*	
NEPAL		*														
NETHERLANDS						*					*			*	*	
NEW ZEALAND			*				*							*	*	
NIGERIA										*						
NORWAY						*				*	*		*	*	*	*
PAKISTAN		*	*			*	*			*	*		*	*	*	*
PANAMA										*						
PARAGUAY								*								
PERU							*	*	*							
PHILIPPINES						*	*							*		
POLAND	*				*						*			*	*	
PORTUGAL						*										
RUMANIA											*					
SENEGAL						*		*		*				*	*	
SINGAPORE							*			*						
SOUTHERN YEMEN										*						
SPAIN						*										
SWEDEN						*				*	*			*	*	
SWITZERLAND						*	*			*	*	*		*	*	
THAILAND							*				*		*			
TUNISIA				*		*				*				*	*	*
TURKEY				*		*	*		*		*					
USSR											*					
UNITED ARAB REPUBLIC										*						
UNITED KINGDOM						*				*	*		*	*	*	*
UNITED STATES						*				*	*			*	*	*
URUGUAY					*						*					
VENEZUELA					*						*			*	*	
YUGOSLAVIA	*									*	*					

to maintain an overvalued currency rather than devalue it, and to adjust the balance of payments by means of tariffs and other import restrictions and by export incentives. In these circumstances, the export incentives include: currency retention by exporters; export bonus/import entitlement; special import licenses for exporters; foreign exchange allocations to exporters; and multiple exchange rate schemes. It is not uncommon for a country to implement simultaneously more than one of these systems; their adoption presupposes the existence of an exchange control which involves restrictions on payments and requires surrender to the authorities, at specified rates, of the foreign exchange earned. While such schemes were adopted by many Western European countries after the Second World War, as their foreign exchange situation improved the schemes were largely terminated or substantially modified; they are now most often encountered in developing countries.

Currency retention. A simple method of providing an export incentive in countries where imports are physically restricted and/or the currency is overvalued, is to allow exporters to retain some or all of their foreign exchange earnings. Such a policy enables the exporter to import the raw materials and components which are otherwise not available for the manufacture of the exports in question. Where similar goods are available locally but at higher prices (owing to the tariff and other protection afforded to the home market) such a policy enables raw materials and components to be imported more cheaply than would otherwise have been the case. To the extent that the currency retained is transferable at premium rates, such schemes provide the exporter, in addition, with a financial incentive. Five countries employ some kind of currency retention scheme (see Figure 1).

Export bonus/import entitlement. In some countries the desired export incentive effect is obtained not by allowing exporters to retain a proportion of foreign earnings but by granting them export bonus vouchers which, inter alia, can be used to purchase imports. This method is used in Ceylon, Pakistan, Indonesia, and Nepal. In Nepal, exporters are rewarded at increasing rates the larger their annual export value; in the other countries rewards are varied in accordance with the export of products which the government wants to encourage.

Special import licenses for exporters. Where imports are physically controlled and licenses are required, an export incentive does not necessarily have to be provided by allowing exporters to retain part of their foreign earnings or by granting import entitlements in the form of export bonus vouchers, since a similar result can be achieved simply by giving individual exporters the necessary authorization to import. In Algeria the "Exim" system is widely used by

exporters of manufactured products. This allows the manufacturer to import necessary goods before the resulting exports are made. Given prior agreement by the competent authorities and proof by the exporter that he has complied with the necessary conditions, he automatically obtains a license to import raw materials to replenish the stocks that have been depleted by prior exports. In India, a replenishment import policy was introduced in 1966 (replacing a scheme dating from 1957) to cover the import requirements of a few specified export industries. New Zealand and Pakistan also use this device in different forms. A similar export incentive effect can be achieved by allocating foreign exchange directly to exporters as in Taiwan, Korea, Poland, Tunisia and Turkey.

Finally, multiple exchange rate systems can be used to provide export incentives. In addition to their other roles—holding down the prices of essential imports, restricting the demand for less essential and luxury items, raising revenue, protecting local industry and charging penalty rates on invisible payments and exports of capital—differential exchange rates can provide more favorable terms for the conversion of currency earned from some exports than for others. The advantages of employing multiple exchange rates for maintaining or expanding exports are normally less marked than the benefits from using them to curtail the volume and influence the composition of imports, and they are used much less frequently for export promotion. To the extent that they are used for this purpose, it tends to be a favored rate to encourage marginal exports that would not otherwise occur. Many countries, particularly in Latin America, have experimented with this technique, with a low exchange rate for traditional export products and a higher—sometimes a free market—rate for exporters of new or "minor" exports. Quite a few of these countries have abandoned this system, however, or changed it to reduce the degree of discrimination.

If the exchange rate is to be treated as given in these circumstances, then there is a justification for export incentives of the types described. Essentially, they are compensatory export subsidies. In the absence of the export subsidies, the pattern of domestic output would be biased towards supplying the domestic market in preference to the export market; it is indeed possible that even wide-ranging export subsidies do not fully compensate for overvalued exchange rates. The central question arises, however, whether in such a situation it would not be preferable to devalue the currency appropriately—a choice that countries have often made. This is a complex question which cannot be fully explored here, though it is important to appreciate the connection between export subsidy policy and exchange rate policy. One view, which is widely accepted and is reflected in the policies of many countries, is that the exchange rate should be used to deal with

balance-of-payments disequilibria of a fundamental nature. The use of tariffs combined with export subsidies would then be an unsatisfactory second-best. But there are arguments against exchange rate adjustment: for instance, frequent adjustments may have adverse effects on long-term capital inflow or may lead to destabilizing short-term capital movements. Devaluation may adversely affect the internal income distribution. Furthermore, if the elasticity of demand for some exports is less than unity—so that extra exports of these goods would lead to so great a fall in their world market prices that the foreign exchange earnings from these exports would actually fall—a devaluation may actually worsen the balance of payments. To avoid these consequences, it would be necessary to associate the devaluation with a tax on these particular exports. The point here is that a devaluation is equivalent to a uniform tariff and export subsidy, and there are arguments against such uniformity and in favor of discrimination in the treatment of different products.

Exemption and Remission of Taxes

Production and sales taxes. A basic feature of these taxes is that they apply to the value of output, or the value of the goods sold, i.e., they are indirect taxes, in contrast to direct taxes applying to incomes of individuals or companies. In order to encourage exports, owners of specified products may be exempted from payment of such taxes on those goods which are exported. When the taxes have already been paid by previous owners and incorporated in the prices of these products, the government will remit to exporters the value of the taxes paid.

Exemptions and remissions of domestic indirect taxes are found in countries in all parts of the world. Some examples of the way these are applied are the following: Brazil: Exports of new and non-traded products are granted complete exemption from both the sales tax and the tax on the movement of goods (consignment tax). India: In all the states, exports are exempt from the sales tax. Moreover, the central excise duty paid on indigenous materials used in the manufacture of an exported product is refunded, with the exceptions of the excise duty on salt, vegetable non-edible oils and tea. In addition the government allows ad hoc rebates, at specified rates, in respect of excisable materials used in the manufacture of articles which by themselves are not excisable and which may be exported. So far, this has been applied to fruit products, in respect of the excise duty on sugar; ribbons, in respect of the excise duty on cotton fabrics; paper bags, etc., in respect of the excise duty on paper; paints and varnishes, in respect of the excise duty on linseed oil; and woollen carpets, in respect of the excise duty on woollen yarn, cotton yarn and dyes derived from coal tar. Tunisia: Exports are exempt from the production tax, and a refund of any taxes previously levied on component raw materials is granted. Denmark: The country changed

from a single-stage consumption tax to a value-added system in 1967. Exported goods are not subject to this tax which, since April 1968, has been levied on other goods at the rate of 12.5 percent. Philippines: Exporters registered under the Investment Incentives Act are allowed a tax credit on raw materials used in the production of exports. That is, in order to offset any domestic sales tax paid on embodied raw materials, exporters receive a tax credit of 7 percent of the cost of the raw materials or a sum equivalent to the taxes actually paid on the raw materials, whichever is the higher.

Direct taxes. A number of countries provide for the exemption from income tax of all or certain of the profits from export. Some costs, such as export promotion expenses, may be deducted in certain cases from taxable income, at times in a greater proportion than the actual expenditure incurred. The establishment of tax-free reserve funds for export has been permitted in some countries. Accelerated depreciation allowances and investment allowances are provided in some countries to enable greater deductions from profits earned by exporting firms before the assessment of income tax or profits tax. "Tax holiday" facilities, which exempt a firm totally or in part from income or profits taxes, especially during the initial years of operation, are provided to exporting industries in some countries. Some examples: Argentina: Since 1967, 10 percent of the value of merchandise exported can be deducted before a firm's profits are assessed for income tax. Colombia: Exporters of certain products receive a special income tax exemption equal to 40 percent of the value of gross exports, provided that such exemptions do not exceed 50 percent of the income tax that would otherwise be payable in respect of total business operations. This concession is not available for exports of green coffee, petroleum derivatives, bananas, hides and precious metals. Ecuador: Profits earned from handicraft exports are exempted from income tax.

In a few countries income-tax concessions vary according to both the level and growth of exports. Such a system has operated in Pakistan since 1963. The income-tax concession is given in the form of a rebate at specified rates in respect of tax attributable to profits derived from exports. Tea, raw cotton, raw jute, jute manufactures and certain other goods as may be specified from time to time do not qualify. If the eligible goods have not been made by the exporter, the rate of rebate is 15 percent of the tax attributable to export sales, plus an additional 1 percent rebate for every increase of 10 percent in export sales over the preceding year (subject to an overall maximum of 25 percent) or less 1 percent for every 10 percent fall in exports over the preceding year (subject to an overall minimum of 10 percent). If the goods have been manufactured by the exporter, the rebate varies with the proportion of total sales exported. Singapore: Profits earned by certain new companies from exports of ap-

proved products are taxed at the concessional rate of 4 percent, instead of the normal 40 percent, for at least 15 years, provided that the value of such exports is not less than 20 percent (applicable to the first year only) of the sales of the company and not less than S$100,000 per annum. For existing companies with "established markets" abroad, the concessional rate of 4 percent on export profits applies only to exports above a base year figure. Ceylon: The government, as part of its measures adopted in 1965 to bolster the export-incentive impact of "tax holidays," allows the cost of advertising specified industrial export goods outside Ceylon as a deduction for tax purposes. Philippines: Registered enterprises are allowed to deduct from taxable income twice the amount of the necessary expenses incurred in promoting the sale of their products abroad. Jamaica: Prior to legislation in 1956, industrial development was encouraged by special depreciation allowances. At present, export industries have the option of either longer "tax holidays" or more flexible depreciation rules. Malaysia: An export-oriented accelerated depreciation system is in operation. Certain companies that export more than 20 percent of their production are allotted an accelerated depreciation allowance for capital expenditure incurred in acquiring plant or equipment to modernize production techniques in existing or new factories.

Like accelerated depreciation and investment allowances, "tax holiday" facilities are only occasionally directed specifically at export promotion. Normally they are intended to encourage the establishment of factories that will contribute in a more general way to a country's industrialization. Moreover, companies taking advantage of such facilities are frequently exempted, for the period in question, not only from income tax but also from other fiscal liabilities. In Peru, for example, tinned-food manufacturers, the fish canning industry, and a few related activities are exempted from internal taxes for five years in an effort to improve their export performance. Tax holiday provisions are relatively less important in industrialized countries than in developing countries, though they are by no means unknown in the developed world.

Export taxes. To levy a tax on exports is by no means uncommon in countries which export large quantities of primary products. However, such taxes can constitute an appreciable hindrance to exports of manufactured products, given the competitive nature of world markets for these goods; therefore, exports of manufactures are often fully or partially exempt from export taxes, sometimes on a uniform basis, sometimes at differential rates. For example, in Bolivia, exports that have undergone industrial processing are free of export duties. Export duties on semi-manufactures such as metal bars and ingots are in general below those on the raw materials—mineral ores for instance—from which they are made. Similarly in Mexico, the policy with respect to export taxes is to ensure that ex-

ports have undergone the greatest degree of processing, and to restrict the outflow of goods needed for domestic consumption. Consequently the great majority of manufactured products are exempt from export taxes.

Ceylon has gained considerable experience in the manipulation of export duties for trade promotion purposes. In the case of tea, export duties have been modified so as to encourage the production and export of higher quality tea and to discourage the export of poorer varieties. In the case of commodities like coconuts the government's policy has been to promote exports of semi-processed commodities (e.g., coconut oil instead of copra) with the result that export duties on copra and coconut oil have been adjusted to provide an incentive for the milling and export of larger quantities of coconut oil.

Import duties. The remission of import duties on goods used in the manufacture of exports is perhaps the most widespread form of export incentive. Remission procedure varies from one country to another in two ways: first, all or only some of the imported raw materials and components in the final product may be eligible. Second, the remission of import duties may be in the form of a total or partial refund (or drawback as it is commonly called) of the duties paid; alternatively, an outright exemption at the time of import may be granted, either directly or by means of bonding or free trade zone facilities.

The drawback system is probably the method most commonly used to remove or relieve the disincentive effect of import duties paid on the goods embodied in products exported. By this device, exporters receive a payment from the authorities, after the export of a product, to compensate for duties paid on the imported items used in its manufacture. The drawback system, however, has two disadvantages: first, production processes are such that frequently it is by no means clear what precise reimbursement is due to the exporter, and in these cases a more or less arbitrary rebate is paid. Secondly, the refund is usually made after the act of exportation and sometimes there is considerable delay, which psychologically minimizes the incentive which the system is supposed to give to exporters. A method which is free of these disadvantages, although not of others, is to allow exporters to import raw materials and components duty free. The concession is sometimes given on a temporary basis and frequently requires some form of guarantee about the resulting exports. Such exemption can be operated instead of, or alongside, a drawback system.

A disadvantage of schemes such as those described above is that, unless they are controlled fairly rigorously, they can lend them-

selves to abuse; it may be possible to import goods duty free that are eventually sold on the domestic market. Two systems that are operated to avoid such abuse are manufacture-in-bond facilities and free trade zones. Manufacture-in-bond is perhaps best suited to enterprises that produce not only for export but also for the domestic market. Free trade zones, on the other hand, are more appropriate where manufacture is exclusively for export, and are especially suited to the needs of countries that have a large entrepot trade.

Free trade zones and free ports are found in Taiwan (Kaohsiung); Colombia (Barranquilla); Denmark (Copenhagen); Federal Republic of Germany (Hamburg, Bremen); Hong Kong; India (Kandla); Ireland (Shannon); Italy (Genoa); Mexico (Coatzocoalcos, Salina Cruz, Matias Romero, Topolobampo); Panama; Singapore; Southern Yemen (Aden); Sweden (Stockholm, Gothenburg, Malmo) and the United States (New York, San Francisco, Los Angeles, Seattle, San Antonio). Libya (Tripoli), Indonesia and the United Arab Republic (Port Said) are in the process of developing free trade zones.

Tax concessions pertaining to sales, income, import and export taxes, while they are the most important, do not exhaust the tax exemptions or remissions that are used to encourage exports. Industrial enterprises can be subject to a variety of other fiscal charges, especially payroll, property and financial transaction taxes; a remittance of those charges affords as practicable an inducement to export as many of those considered above.

[Excerpted from Incentives for Industrial Exports. New York: United Nations, 1970, TD/B/C.2/89/Rev. 1, pp. 4-8, 11-12, 28-42 and 45-46. UN Sales No. E.70.II.D.8.]

☆U.S. GOVERNMENT PRINTING OFFICE:1972-481-194/2